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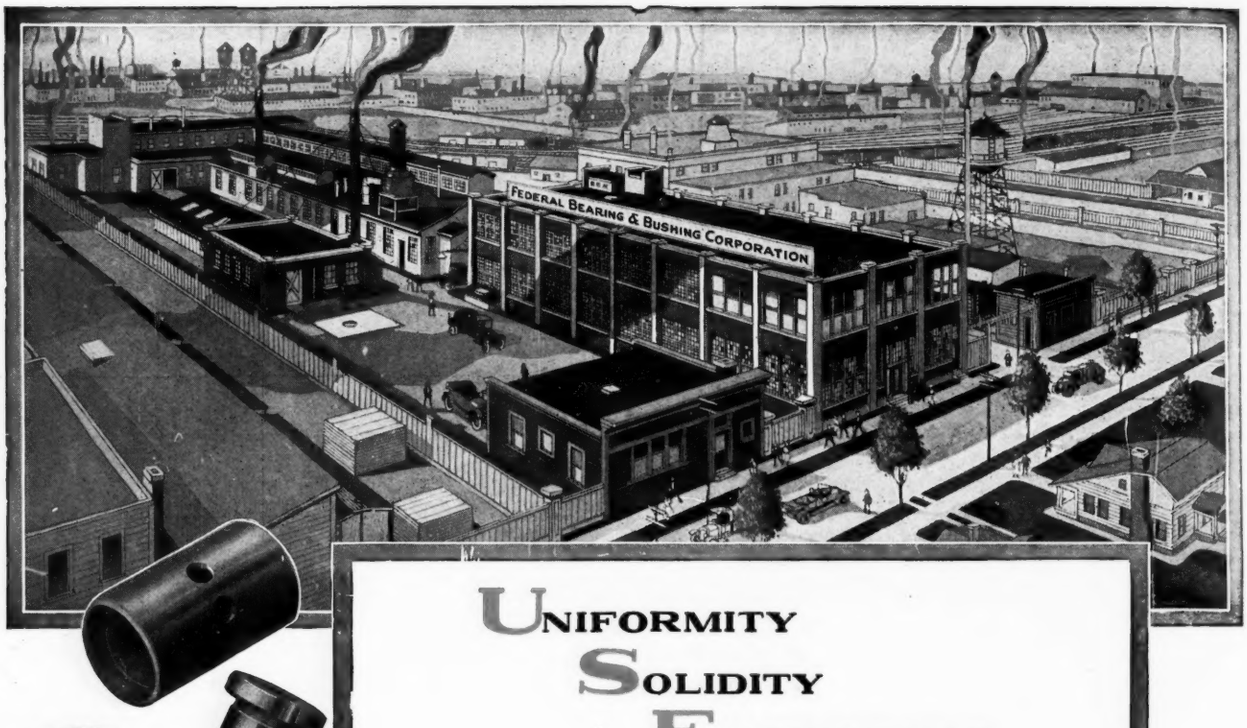

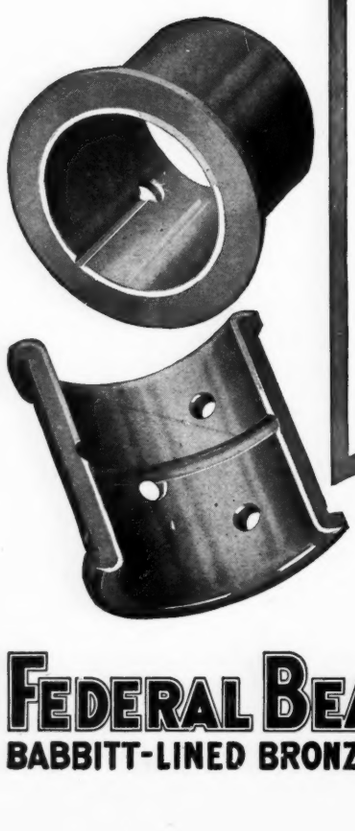

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VOL. XLIII NEW YORK—THURSDAY, JULY 8, 1920 No. 2

European War Factories Near Peace Time Output

Increased in size and with more and better modernized equipment for both quality and quantity work the automotive industry of the Allied countries is quickening into production with enormously developed selling possibilities. This article by Mr. Bradley is an analysis of these conditions.

By W. F. Bradley

THE author of this article is the European correspondent of AUTOMOTIVE INDUSTRIES. He has just sailed from New York en route to his home at Paris, after a visit of several weeks in the United States. His article here is a comprehensive study of the European situation, written after his visit to Detroit, Indianapolis and other automotive centers in this country.

THE two outstanding features of the European automotive industry, as it presents itself since 1914, are the increased manufacturing facilities and the enormously developed selling possibilities. In France, in England and in Italy automotive factories have all grown under war conditions and are now almost on the point of showing their possibilities as producers under peace conditions. Belgium alone, of the Allied automotive-producing nations of Europe, has not increased her manufacturing ability.

The growth of the automotive factories was one of the inevitable consequences of the war. Although the development was not the same in the three leading countries, the result is uniform; namely, that the factories are all considerably increased in size, modernized, and better equipped for both quantity and quality work. The change has been so great that in not a few of these factories it would now be impossible to find a single machine tool which was in service in 1914, while in many cases a brand new factory has been built around the old one.

Right at the beginning of the war the French automotive factories were taken off the work for which they were designed and set to producing shells. Progressively, and yet with great rapidity, they were transformed from shell work to aviation engines or to special automotive work, such as tanks, artillery tractors, army trucks, etc. At the armistice not a single French automobile factory was engaged exclusively on automobile work, and the percentage of such work being done in these factories varied from zero to 25.

In England the greatest difference was that the automobile factories were not immediately switched from peace to war conditions in August, 1914. Under the common delusion that the war would be short, manufacturers endeavored to keep their organizations together; the cry was "business as usual," and war contracts were shunned. It was only after several months, when the seriousness of the military situation had been realized, that the automotive factories were fully utilized and the development from that time paralleled that of France.

Italy had a different history, for, coming into the war at her own time, she realized the importance of motor transportation and, instead of transforming her factories into shell plants and later developing them into aviation engine-producing plants, she kept them on automotive work on a growing scale. Naturally, the Italian factories could not ignore the aviation engine, but they never lost their automobile character. While in France and England some 15 per cent of automobile work may be considered a fair proportion of the activities of the automotive factories, in Italy the factories were 70 per cent army automobile and 30 per cent aviation or special.

One of the consequences of this was that, while France and England imported large quantities of American cars and trucks for their armies, and now have these on civilian service, Italy placed only one small contract with Ford. This development, too, gave Italy a certain advantage when, in November, 1918, the European manufacturers were surprised by the armistice. The Italian factories, being nearer to their original business, ought to have been the quickest in getting back to peace production. Logically, England should have come next, France third, and Belgium fourth.

The results, however, have not been as expected. Italy has only a very slight lead on the group. Belgium has displayed wonderful recuperative powers, while, despite the greater difficulties she has had to contend with, France is fully as advanced as Great Britain.

Surprise is felt in America at the slowness of the European nations in getting into production. The persons concerned are no less surprised, or disappointed, according to their viewpoint. It was generally felt that less than a year would be ample to switch the war-developed automobile factories of France, England and Italy from a war to a peace basis. This has not been the case, and at the present moment there is not a factory in Europe that has completely lived up to the program mapped out at the end of 1918. Full production will not be attained until next spring.

It is hardly necessary to say that conditions are varied, for, while some factories have not delivered a single automobile to the public since 1914, others are very well advanced with their plans. In organizations, as in individuals, value is only fully revealed in times of stress and crisis, and it has needed the critical transformation period to show which firms really possessed sound, vigorous and powerful management. During the war any firm could develop, for orders were to be had for the asking, and financial assistance could always be assured either direct from the Government or indirectly through the banks. The size of a factory, therefore, at the end of the war was no real criterion of its merit.

Ignoring the personal element, the factors which have delayed the automotive factories are transportation, lack of materials, labor and adverse exchange rates. Transportation difficulties are world-wide, but they are most keenly felt in France, where, as the result of the war, the railroads are wornout, the rolling stock being out of date and the permanent ways in need of extensive repairs. Not one per cent of the passenger trains arrive on time, while freight is not only delayed, but in many cases is lost completely or ruined in transit. The calamitous working conditions have had their influence on the railroad worker, who appears to have lost all sense of personal responsibility and who no longer takes any pride or interest in the organization to which he is attached.

Transportation and the shortage of materials are closely connected. As an example, there is a general shortage of coal in France, and this lack is often aggravated by poor transportation. The region around Paris contains 80 per cent of the automobile factories of France. All the coal required for this region has to be sent from the outside—Belgium, England, the east of France, or America. The electric generating stations have small or no stocks, and any delay in transportation, added to the natural shortage, directly affects the factories. Even now the supply is so limited that each factory in turn has to shut down one day a week. Another plan which has been tried, with very indifferent success, was to make a portion of the factories run on day work and another portion on night work. This entailed endless complication, caused an entire upheaval of the social life of the workers and was not at all economical.

Some of the smaller factories are running their machinery by means of agricultural tractor engines, or even ordinary automobile engines. The big factories are putting in their own power plants so as to make themselves independent of the variations of the public power stations.

Many of the commodities required in the construction of an automobile are either unobtainable or are only secured with the greatest difficulty and at enormously enhanced prices. Glass is hard to find, leather is scarce, sheet metal is procured with difficulty, and there is a general shortage of tires, etc., the consequence being that even when a manufacturer gets into production he is constantly being held back by the lack of some component not manufactured in his own shops.

France introduced the eight-hour day soon after the armistice. This was a sop to the working classes and, while in itself an excellent measure, its method of application has been most unfortunate. A portion of the workers, with a life-long experience of the 60-hour week, increased during the war on an average to 70 hours, do not know what to do with the leisure afforded by a 48-hour week. Manufacturers complain that the country's output is handicapped by the untimely introduction of this measure and every such complaint is resented and recorded by the radical element as an attempt on the part of capital to rob labor of a hardly acquired liberty. The situation will undoubtedly right itself in time, but in the meantime automotive production is being delayed.

As a final difficulty, the European nations, and particularly France, Italy and Belgium, have had to battle against very adverse exchange rates. When America might have transacted a valuable amount of business and at the same time have assisted the European nations to get back on their feet, the exchange rose until in France 17 francs, instead of a nominal 5, had to be paid for the dollar, and in Italy the rate was 23 to 1, instead of 5 to 1 normal. By an international agreement, Belgium was assisted by being given three-year credits on America for the purchase of the machinery and the plants necessary to get into production. This was a much appreciated measure, which has helped enormously in getting the plucky little nation back into the manufacturing field. At the present moment, the worst of the exchange difficulties appear to be over, but the difficulties they have caused have been acute and the impressions they have left have been unfortunate. Throughout

France, in particular, there is a feeling that mere moral support from America during this period would have been sufficient to remove all the difficulties and disadvantages attendant upon the exchange situation.

It is because of the adverse rate of exchange that the French Government took the decision a few weeks ago to shut out some 500 different articles of a luxury or semi-luxury nature, including passenger carrying automobiles. This measure, of course, is temporary and will be repealed when exchange returns to something like a normal basis. Italy, being in an even more unsatisfactory position, also shut out imports and automobile manufacturers are threatened with a decree to compel the export of 90 per cent of their goods.

All Europe has been motorized by the war. In France the change has been greater than in any other country, for, being closest to military activities, the value of the motor vehicle has been most forcibly driven home. Up to 1914 the purchasers and users of the automobile were a class—a mere sect in the nation. The great farming element was ignorant of the construction, operation, or general utility of motor vehicles.

The nature of the battle front made it necessary for the Allies to develop their military transportation by means of automobile trucks rather than by rail; and the shortage of man-power obliged the Government to train as truck drivers and mechanicians that section of the nation which had been the farthest removed from the automobile movement. No man was admitted to the French automobile service unless he was more than 38 years of age or physically unfit for service with fighting troops. His knowledge of automobiles was not considered a qualification. Consequently, the farmers of France became the automobile drivers of France and, at the end of the war, there were in the country not less than 500,000 men, mostly from the agricultural classes, who had acquired a thoroughly sound knowledge of the use and operation of the truck and passenger car. There must be added to this several million men who, while not directly engaged in the operation of automobiles, were yet brought closely in contact with them, for they received their daily food entirely by automobile, they were moved from point to point by automobile and they were carried away by automobile when wounded.

The mental attitude of the nation toward the automobile has changed entirely. Instead of the automobilist being one of a special, select class, he is now found broadcast, and at the present time there is no more necessity for a campaign to convert Frenchmen to the utility of the motor vehicle than there would be for such a movement among citizens of the United States.

This changed attitude of the nation naturally was taken into consideration by manufacturers when laying out their post-war programs. A few in France have tried to make the automobile the great utility vehicle it is in America. Citroen has taken the lead in this direction, and is now closely approaching an output of 100 cars per day. Berliet has a similar plan, which he has not yet put into production. Bellanger is operating along similar lines and Peugeot and Renault are both interested, although not exclusively, in cheap motor vehicles.

The French manufacturers, however, appear to have less faith in the great utility automobile than the French public, and are not giving all the attention to the cheap, popular car that is desirable. Their impression appears to be that on cheap production work they cannot compete with America and that it is, therefore, advisable for them to remain in a higher class of production. Eight years ago it was necessary, in France, to apologize for the Ford or any other cheap make of American car. Now no such apology is necessary, and automobiles are being judged, by great numbers of the people, by their ability to work rather than by the niceties of their design or their careful finish. The European manufacturer, however, is handicapped by his past history, and even when studying cheap production he shows a tendency toward Swiss watch methods.

There has been no serious attempt in Europe to get down to the simple, general utility car, with all the essentials but none of the trimmings of an automobile, such as is common in America. It would appear that competition between Europe and America is going to be on the basis of quality against quantity. While European makers are simplifying their design and cutting production costs, they have sought in every case to remain on a higher level of design and finish. This is due in a certain measure to the tendency of the European to regard an automobile as a permanent investment rather than an article of common use to be replaced as soon as worn out. Time alone will show whether the increasing motor public will prefer the European type, highly finished automobile or the cheaper, machine-made American article.

Several of the European manufacturers have completely changed their class. Hispano-Suiza, instead of specializing on a sporting model, now makes one of the most costly cars on the market. Delage has jumped out of the moderate priced and comparatively small car class into the highest class. Darracq has moved from the four to the eight. There has been a reduction in the number of types produced, but very few firms have one model only. Fiat is building three types of passenger cars: two fours and a six; Panhard-Levassor has retained three models; Peugeot has the same number, and Renault has four. Lorraine-Dietrich will specialize on a light six, but will have two, if not three, high-priced cars. De Dion Bouton has three types, two of them being with eight cylinders and one with four cylinders. This desire to satisfy every class of client appears to be a mistake, for already it is observable that those firms most advanced in production are precisely those building one model only.

Several general lessons have been learned since 1914. Every car built in Europe from now on will have electric lighting and starting. Four-cylinder engines will dominate, with the six following next and used generally for the higher class products. The detachable head is very general. The battle between magneto and battery ignition has not yet been fought out. Hispano-Suiza, Darracq and Lorraine-Dietrich are prominent supporters of the

THE CONTINENTAL TREND

DETACHABLE-HEAD, four-cylinder engines, with the six for the higher class productions, predominate in the European factories. Engine sizes are small, the great majority having a displacement less than 183 cu. in., Mr. Bradley reports. Electric lighting and starting has become customary equipment, but the battle yet wages between battery and magneto ignition. Detachable metal wheels only are being used, and front brakes feature most of the better cars. Few makers, it is found, are concentrating upon only one model, although there has been a reduction in the number of types produced, and several of the French builders have completely changed the class of their cars.

battery, but the magneto still holds the majority.

The average size of engines is much smaller than in America and will remain small. Probably 80 per cent of the automobiles produced in Europe during the next twelve months will have a piston displacement of 183 cu. in. or less. Gasoline economy is being given very close attention, in view of the increasing price of fuel. Front wheel brakes are a strong feature of high-grade cars. The wood wheel is dead, only metal detachable of various types being used. American straight side tires are not yet known to the European public, clincher beads being used throughout.

Although lighting and starting is now universal, European manufacturers appear to be blissfully ignorant of the troubles that lay ahead of them by reason of an uneducated public. The European automobile owner gives more attention to his car than the average American, but even he is very neglectful of his battery and, as there are no service stations and no campaign has been started to educate users to the care of a battery, trouble is bound to develop as soon as the new cars make their appearance in quantities.

The tire question is already beginning to make itself felt in a small way. Large quantities of American straight side tires were left in France by the American army and sold on American army automobiles. This type of tire also has been imported on American automobiles in England.

In some cases the introduction of the straight side tire has been received with hostility. The leading French tire manufacturer has circularized his dealers against it, declaring that this type of tire, with its locking mechanism, is unmechanical and unsatisfactory and should be opposed by every possible means. It is recommended that clients who have bought cars with straight side tires should be induced to change their equipment to clincher. A campaign has also been started in the press and evidence that this has had its effect is shown by letters from dealers to the editors of the papers, protesting against the introduction of the American type tire.

Most of the tire manufacturers, however, adopt a reasonable attitude. Dunlop has put out a giant straight side tire and others have declared that if there is a public demand for straight sides they will meet it. In some cases they state that if the straight side is manufactured in Europe it should be built to American and not to European dimensions, so as to prevent further confusion. The fight between the clincher and the straight side is likely to become acute within a year, and the first effects will be felt on foreign markets, such as South America, Australia, New Zealand and other countries where European and American cars meet in competition.

Truck development has been given an immense impetus in all European countries, and particularly in France, since the armistice. Everything has helped toward this, for there was immense war experience to show the value and reliability of trucks, the vehicles became available with the armistice, and thousands of experienced truck drivers and mechanics were set free by the return to peace. As a further aid toward the development of truck services the railroads broke down just when they were most required for reconstruction work. At this critical position trucks came to the rescue, for private initiative organized regular truck services all over the country, but particularly radiating from Paris to such centers as Cologne and Coblenz, Germany, to Bordeaux, to Marseilles, Havre, Dieppe, Nancy, Lille, etc. In addition to these services, hundreds of manufacturers and traders adopted truck transportation because there were no horses for local work and no reliable trains for long-distance haulage.

These truck services, which were a necessity under France's misfortune, will remain permanently, for, although the railroads will improve in time, there will always be a big need for rapid road transportation over short, medium and long distances. The saving in time, the economy resulting from reduced loss and breakage will always be sufficiently important factors to justify the extra cost per ton-mile. As an indication of the long-distance haulage undertaken, household furniture is sometimes removed from Scotland to Nice, in the south of France. This is worth while, when the furniture is valuable and liable to be damaged by the various trans-shipments necessary by rail.

The breakdown of older methods of transportation has also given an impetus to aerial transportation. At present the most successful and widely used air line in Europe is that from Paris to London. It is certain that if conditions had remained normal this would not have assumed its present importance. But with rail service slow and unsatisfactory or stopped altogether by strikes, travelers were induced to travel by air, and, having once got the habit, retained it.

For over a year now there has been a regular air service between the two capitals, from one to a dozen planes starting from the terminals each day and depositing their passengers at their destination about 2½ hours later. Not only are passengers carried, but there is a regular mail service for such letters as are marked for air transportation. A parcels post also functions regularly. A daily Paris-Brussels service has also been organized and there are other regular passenger and mail-carrying services in the south of France and to the north African possessions.

The French Government is giving every encouragement to civilian aviation, and is preparing to take full advantage of its war legacy in the shape of prepared landing grounds, repair stations, metereological service, etc. A most valuable ground organization was gotten together for military purposes, so that at the present time there is no section of France into which an aviator may venture without being sure of finding grounds on which he can land with safety, as well as supplies, mechanical assistance and weather reports. On the Paris-London service, complete weather reports are available and, on the newer machines, the pilots are in communication by wireless with land stations during the whole of the flight and know exactly what weather they will find ahead of them. This frequently makes it possible

EXPORT COMPETITION

THE European maker, Mr. Bradley says, has made no serious attempt to produce a simple, general utility car, the result being that the competition of Europe's factories will be one of quality against quantity. This statement was made despite the fact that at least one company in France is nearing a production of 100 cars a day and that others have so-called quantity production schedules under way.

Greatly increased manufacturing facilities have resulted from the war work, Mr. Bradley reports, but the makers themselves have not been converted to the idea of the popular car—a tendency, likened by the writer, to the making of Swiss watches.

to accomplish a flight which would not be undertaken if only local conditions were known; it also diminishes risk by preventing flights being made in unsuitable weather.

This year's budget for aviation will probably be 300,000,000 francs and will be spent in subsidizing air lines, in engine competitions and in experimental work. At the end of the war the output of the French aviation factories was 3000 planes and 4000 engines a month. This has been decreased to very small numbers and only those firms which were in the aviation business before the war have remained in it now. The problem which is being given the greatest attention is the development of a long-service, reliable engine. A competition with valuable prizes will be held next year with a view to encouraging the production of robust, economical, long-service aviation engines. It is recognized that the short-lived engine of the war period is quite unsuited for commercial flying.

With the return to peace conditions, agricultural tractors became of primary necessity. The war not only killed off horses but it transformed the farmers into motorists, so that, when these men were freed from military service, they had no hesitation in taking to tractors instead of animals for their agricultural work. Large quantities of American tractors were bought by the Government and either sold to farmers or were used for plowing the land in the old war zone. It was only after the land had been cleared of war wreckage and plowed over that it was handed back to its owners.

The big farmers buy their tractors outright, but the most general method of selling is to groups of farmers who make use of the machine on a co-operative basis. These groups have a right to a Government subsidy which in some cases is equal to half the purchase price of the machine. So extensive and so successful has been the use of tractors that this year, for the first time, it is probable France will not have to purchase any wheat abroad. This news has already had a beneficial effect on the rate of exchange.

With very rare exceptions, the French tractor business is in the hands of the French automobile manufacturers. The leading producers are Renault, Peugeot, Latil, De Dion Bouton, and Fiat in Italy. The agricultural instrument maker almost entirely has been kept out of this field.

The house-lighting equipment as known in the United States has not made its appearance in France, Italy or Belgium and is only slightly known in England. In France electric lighting is known in the large towns where generating stations are located and in the mountains where electricity can be obtained from water power. Outside of these regions antiquated forms of house lighting, such as kerosene lamps and candles, are still employed. There appears to be a field here for the successful house-lighting sets which have been developed in America. To make these successful, however, a big campaign would have to be undertaken and dealers would have to be prepared to supply low voltage lamps and fittings for their sets. At present practically everything is 110 volts and lamps and other fittings for 30-volt sets cannot be obtained.

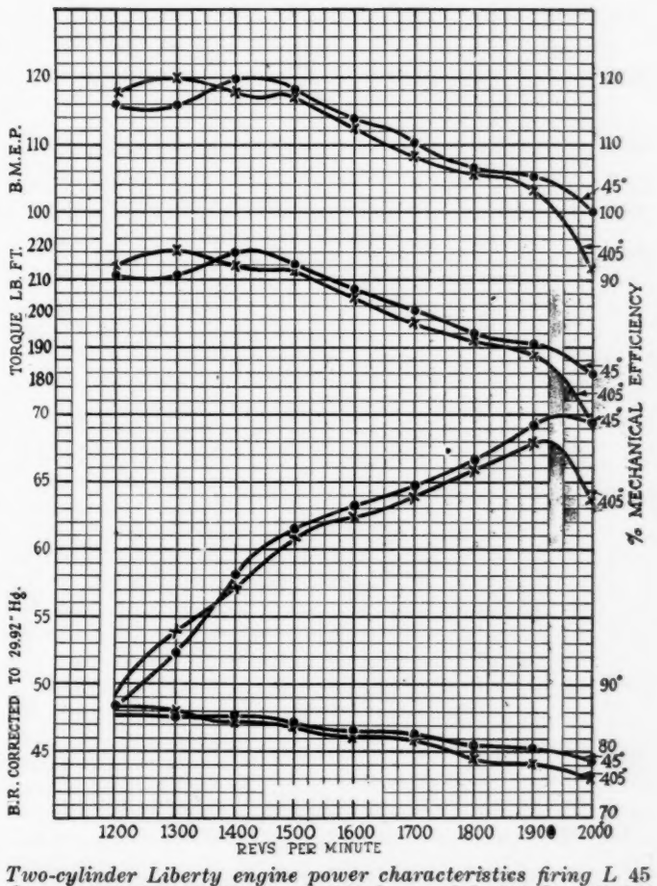
Effect of Firing Order on Power Output

DESIGNERS and others concerned with V type engines will be interested in a series of power runs made at McCook Field, Dayton, under the auspices of the Airplane Engineering Department of the Bureau of Aircraft Production. These runs were made to determine the power characteristics and differences in vibration in a two-cylinder Liberty engine between power impulses occurring 45 deg. and 405 deg. apart respectively. It was discovered that the difference in power output was small and within the limits of variation arising from change in conditions. The engine vibration was of about the same intensity and occurred at about the same periods irrespective of the timing, indicating that unbalance of the moving parts was the major cause of vibration.

The maximum vibration of the engine was noted at 1200 r.p.m. and a secondary period at 1800 r.p.m. The vibration periods and "amplitude" remained unchanged with either timing and during the friction test in which the engine was "motored" over.

From 1000 r.p.m. to 1300 r.p.m. the difference in power was in favor of the 405 deg. timing. From 1400 r.p.m. to 1900 r.p.m. the 45 deg. timing developed more power.

The mechanical efficiency of the 405 deg. timing dropped off more rapidly than that of the 45 deg. During these runs it was observed that there was a considerable blowing back through the carbureter. The brake mean effective pressure above 1500 r.p.m. fell off much more rapidly and to much lower points than is usually the case with eight or twelve-cylinder Liberty engines. The power output was at least 10 per cent lower than that of the Liberty twelve, per unit of piston displacement.



Two-cylinder Liberty engine power characteristics firing L 45 deg., R 675 deg., L 45 deg., R 675 deg. and L 405 deg., R 315 deg., L 405 deg., R 315 deg.

ONE of the tool steels developed in recent years, a cobalt-chrome alloy, has the peculiar property of practically not changing its volume on hardening. This makes it very valuable for accurate taps and dies.

Closed Bodies for Low-Priced Quantity Output

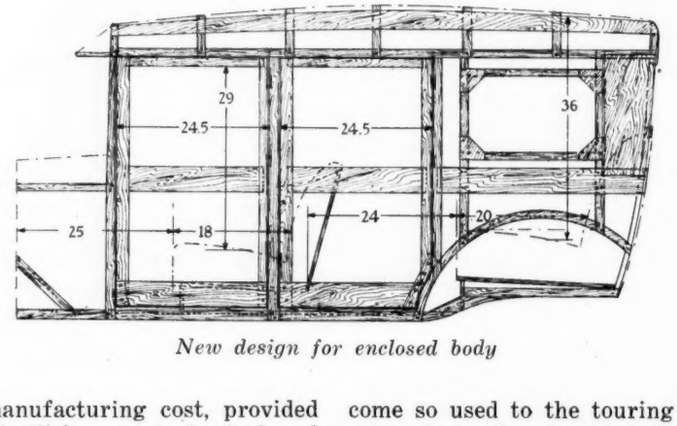
With manufacturers turning their attention more and more away from the open body, Mr. Mercer predicts that many changes will be necessitated in closed jobs. He suggests here a design that points out the way for some of the evolutions that will mark future development.

By George J. Mercer

NO one has been able to predict just what changes are likely in closed body designs but there is today more interest on that line than at any previous time. Thought is focused on large quantity production of closed bodies. Cost must enter into the specifications as more of a factor than formerly.

In the past, the touring body was offered at an attractive price and only the buyer who was willing to pay came forward and purchased the closed car. Now we are to see the closed body put forward as the favorite and, although we are in the period when costs have mounted to a dizzy height, attainment of future normal conditions is the aim.

Manufacturers are now considering their future output at 50 to 75 per cent. of closed work. A variety of models is a thing of the past and the American builder is designing for the local market without attention to the foreign ideas that have had so important an influence in former years. Therefore, it seems reasonable to suppose that, with clear competition as the one incentive, cost in manufacture will be given more weight in design than at any time in the history of the trade.



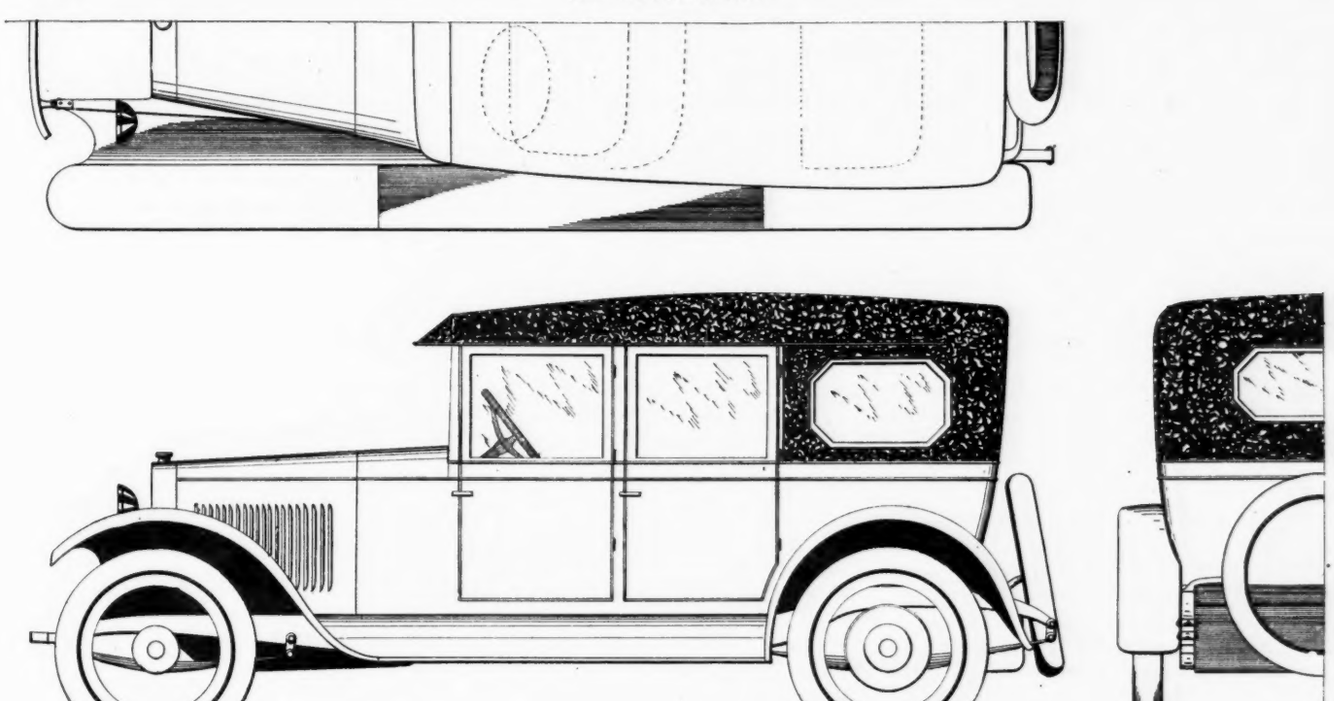
New design for enclosed body

Style and character can be obtained in designing together with the minimum manufacturing cost, provided adequate research data and facilities are to be had and we know these are available in large plants where quantity production has been carried on for years. Therefore, the closed body must become the same to the trade as the open model has for so long and this will mean that methods of manufacture must be developed whereby such bodies can be sent through by similar processes of enameling. This will necessitate the greater use of metal and less of wood, because the latter cannot be subjected to the oven heat necessary to get quick results. To substitute metal for wood in closed bodies, there will have to be changes in the methods of installing windows and fittings—that is the runways must be changed from wood grooves to metal and the locks, and possibly the hinges, must be modified so they may be attached to metal. The pioneer in this work will have to make practically all the fittings for the job, as standard parts will not be adapted. Therefore, time will elapse before we have the revolution in the trade that is foreseen. But new methods will come into force from time to time and some of these less conspicuous results will have an effect in reducing cost and establishing design.

Therefore, the design submitted here, while it does not meet the real price cutting needs, is one of the trails by which the newer designs will come before the public. The use of fabrics, together with cheaper woods reinforced by metal angles, the minimizing of the number of models and quantity production, are among the steps in sight, but greater changes will need time, as radical changes will require sure proof of their reliability before the big cost for preliminary die and pattern work can be undertaken.

We have had closed bodies in which the upper part has been covered with fabric above the belt. Coupés, for instance, have been and still are so made but few of them looked well. That was because too small a part of the surface was so covered, and the upper part of the body had an unsatisfactory appearance. To balance up a fabric covered quarter and back, the roof should be deeper on the sides and should have more of a hood appearance. The reason for advancing this theory is that we all think relatively; we cannot help but compare, and we have become so used to the touring top shape that a fabric top seems best when it approaches this pattern.

The reason for the use of fabric as illustrated is to reduce weight and save cost, two most essential points in a motor car. The saving of weight is admitted but the saving in cost is not so much as would be wished. The cost is slightly less than the cheapest form of metal and solid roof construction that can be used. By the cheapest metal construction, we refer to all upper pillars of wood being exposed, by the rear quarter panel ending back of the window opening and being covered with an upright moulding and only the metal formed into the window opening at the rear. Also the metal sheet does not have a formed swell and the corners are simply wrapped, necessitating no die or hammer work. The roof is of fabricated panel, glued on, and the edges only are covered with canvas. The actual cost of covering the roof and side and back surface above the belt will be about $12 for labor and material, either for the fabric as shown or for the cheapest form of metal construction. There will be an additional cost on the lat-



Details of the new Mercer design

ter for painting but a slight saving in glass with the fabric as the windows are shorter.

This design has the decided advantage of being lighter in weight and will look cooler in the summer, although no particular advantage can be claimed over the standard sedan. The appearance of coolness has a satisfying effect and it affords real comfortable protection for the bad season of the year. As there is no sacrifice or makeshift about this design, it serves in every way as the ordinary sedan or coupé, all the windows on the sides drop full length, even the rear quarter window will disappear, being made narrower to serve this purpose.

The quarter window shape is not original, as it has been used for some time past on coupés. It has, however, always been nearly square, but the octagon window is pleasing and it is just as easy to have it drop, because the glass itself is square angle at the corners and slides in the pillars as does the door glass. The back window is also made the same shape.

In order to have the cotton fabric hold its shape on the round corners of the top and back corners, it is necessary first to cover these parts with metal. The goods then are pulled over tightly. No cloth fabric will retain its shape unless reinforced in this way over rounded surfaces; temporarily this can be effected but in time the goods will fall in and the top look shabby. The sectional view will show the extent of the reinforcement.

Cotton fabric covered bodies are popular just now, in fact there are bodies in use in which the entire surface of the body is so covered, no part being excepted. Such appearance is not unpleasing, as variegated colored goods are used for this purpose, generally that with green predominating. This is suggested for the design illustrated. It has less of a ponderous appearance than with all black. Any color for the balance of the car will harmonize with green but the best combinations are when the other colors tone nearly to the fabric color. Two tones of green with black fenders and chassis frame are both durable and moderate in cost.

The interior finish is generally cloth, which is really necessary for the seats of a winter car. Although leather is more serviceable for the driving seat cushion and back, the upper part of sides and roof are cloth, unless finished skeleton—by this it is meant that the wood parts above the top of the window line are finished to paint. At the last New York show there was a considerable increase of skeleton tops. These are no more economical, as the extra labor to finish the woodwork for painting is equal to the additional amount of cloth used, but for summer use the skeleton top has a cooler and more sanitary appearance and in winter there is no difference as far as the warmth is concerned.

For high grade work, cane is put directly under the fabric top and above the bows for the inside finish, or the goods can be painted the same as the wood. Generally a gray color is preferred but the under side of the projecting hood at the front should be painted green.

There is one feature about this form of top that is harmonious, that is the extension hood at the front is really a part of the top itself rather than an addition as with most cars. The opaque hood or visor has become a necessity, yet it has only been adopted within the past year. It saves in glass cost and is more suitable than glass, as it saves the driver from the sun's rays. On many cars, this hood is made to fold up when not required but the folding-up attachment is seldom used.

The design here shown is moderate in length and does not obtrude enough to need taking off at any time, but with a visor of this hooded shape, there should be vent holes to permit the air that pockets here to make its escape and eyelet holes, three on each side, are made for this reason. The frame supporting this is simply $\frac{1}{8}$ x $\frac{3}{4}$ in. flat stock, formed to carry the line of the top with rounded corners from one side to the other. It is fastened solid to the front rail of the top and riveted to the drip moulding, the top goods being caught between. This drip moulding is continued on the sides to the rear of the quarter window, the top goods being fastened under it, then seamed at the back bow to the upright part forming the cover for the back and sides.

At the window openings the goods are fastened under a moulding. This is optional, however, as the cloth may be brought into the opening and fastened inside and no painted part need show. All mouldings used to fasten the goods at belt and on pillars are lead filled and are either nickel or brass finished, as there is no chance to paint the moulding after assembling and painted mouldings will chip when put on with mallet and block. The body is comfortable for five passengers on a chassis wheelbase of 115 in. and the doors are large.

The height is very low. Thirty-six inches above the cushion will be sufficient for the average person seated, but there is nothing to spare. One dimension that has been worked to the limit is the height that will enable the average person to see through the side below the top and not have to bend. Thirty inches is the average height above the seat to the point of vision. On this design, we have made that height 29 in., but 2 in. will be added for the depression of the cushion, so that when seated there will be ample room for seeing out. The seat is low and, as there is a greater tendency to lean back with a low seat, this will help in the right way. Height, throughout, has been sacrificed to a reasonable degree to get the ideal low looking job and the length has been augmented by the use of the horizontal belt moulding.

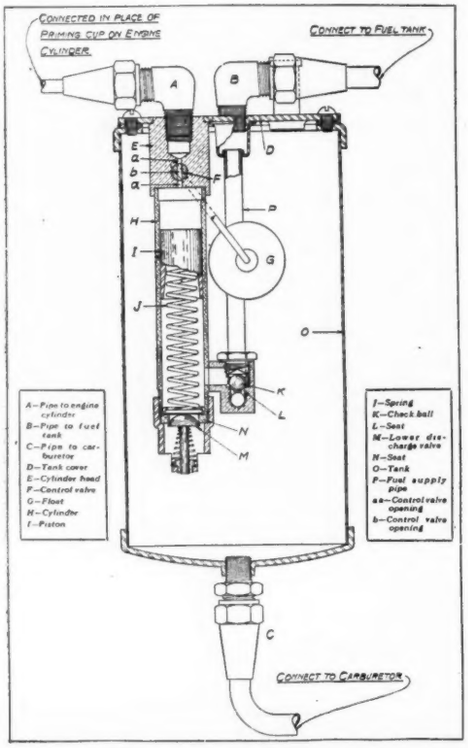
The appointments in this type of body are becoming more modest as time goes on. The use of vanity cases are not considered as much as formerly. If used they are generally limited to one on the left side on the door but there is not room enough on the sides back of the door for this, as the trimming is generally plain to the seat back and the arm rest will take up all the room to the door. The lights are about the same as always, either three dome lights—one in the center and two at the rear —or the single dome light and two corner reading lamps. Although the appointments are less in number the quality is higher, as the parts, including inside door handles, pull-to handles, lace holders, etc., are uniform in design. Dull finish silver should be used largely.

The door windows are, of necessity, operated by regulators. The quarter window is not often so used, as the space will not permit, and anyway it is not so inconvenient to raise and lower the quarter window by hand as the doors, because the person operating the former is conveniently placed to exert his strength to advantage. On the quarter window, the handle of the regulator would be very inconveniently placed, therefore the use of such a device in this way has never found favor.

Other features of this new design are not different from the customary body, the construction being of wood framing and metal panels, of 20 gauge steel. Outside or visible door hinges are necessary, as the room to open one door against the other will not permit of concealed hinges which give a longer throw.

Fuel Feeder Uses Cylinder Pressure

A NEW fuel-feeding device has been announced which makes use of the compression in the cylinder and is therefore the direct opposite of the vacuum system. One of its advantages is said to be that when the car is in mud or snow and the engine is laboring hard at low speed, fuel is still supplied. Also, the supply is dependent on the motor and hence follows its needs.



The Sparton fuel feeder

This device is the Sparton Fuel Feeder, manufactured by the Sparks Withington Co. The operation is simple. When the engine turns over the compression from the cylinder to which it is attached is conducted through piping A to and through control valve F by way of openings aa and b into cylinder H. This forces the piston I down and compresses spring J, which expels air in the lower end of the cylinder through valve M. As the piston in the engine travels down the pressure in the top of the cylinder H is relieved and the spring J returns piston I, causing a suction in the lower end of the cylinder which draws liquid from the main tank into the lower end of the cylinder through check valve K. As the engine piston again rises and puts pressure in the upper end of cylinder H, causing piston I to move downward, the liquid in the lower end of the cylinder is forced out through the discharge valve M into tank O. This operation is continued with each stroke of the engine piston, until a few strokes of the pump piston have been made.

The liquid discharged into tank O runs to the carbureter through pipe C, and, as the engine starts running under its own power, the pressure from the cylinder is greater, driving the pump piston farther, causing a greater suction and lifting the fluid rapidly. The piston in the pump continues to operate until the gasoline in the tank O has raised the float G to such a point that the control valve F has closed openings aa and b, which shuts off pressure from the engine cylinder and stops movement of the pump piston.

As the engine consumes fuel the float lowers, slightly opening valve F, and piston I in cylinder H again starts pumping, supplying enough gasoline to take care of the demands of the engine.

The Sparton Fuel Feeder is a small cylindrical tank mounted under the hood. It is claimed that as the moving parts are few this device is very durable. All of the supply in the device is available, as there are no valves between the feeder and the carbureter.

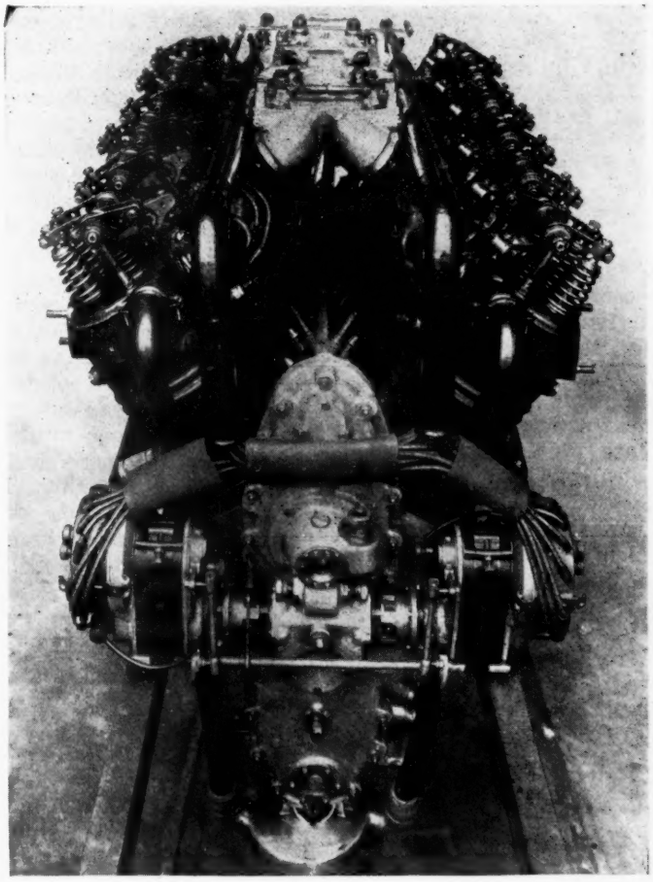
The New Series Vee Type German Benz Aero Engines

The German authorities based all their plans on the six cylinder vertical type of engine during the war and it is only recently that any other form has been built in quantities. The Benz company has been making airplane engines for many years and is a representative German firm.

By Erik Hildesheim*

THE two outstanding German motor works of the Daimler-Mercedes company in Stuttgart-Untertürkheim, and Benz & Cie., in Mannheim, have always been sharp competitors even back to the days of producing the pioneer motor vehicles and meet again in the line of aero engines.

While the Mercedes airplane engine had, curiously enough, a hard struggle to get established in early aviation days against the then dominating Argus engine in Germany, the Benz four-cylinder engine came straight forward to win the first Kaiser Prize competition as a sound motor engineering job, and was first afterward tried out in the air by the then German champion pilot Hellmuth Hirth, who also, together with others, put up some altitude records at the Vienna meeting immediately before the war with the new six-cylinder Benz model. Being lighter than the Mercedes the Benz engine was not considered as reliable but as the seaplanes required higher horsepower, it soon came into dominating favor with the Navy, which built the Benz engines under license during the war at the Imperial yards.



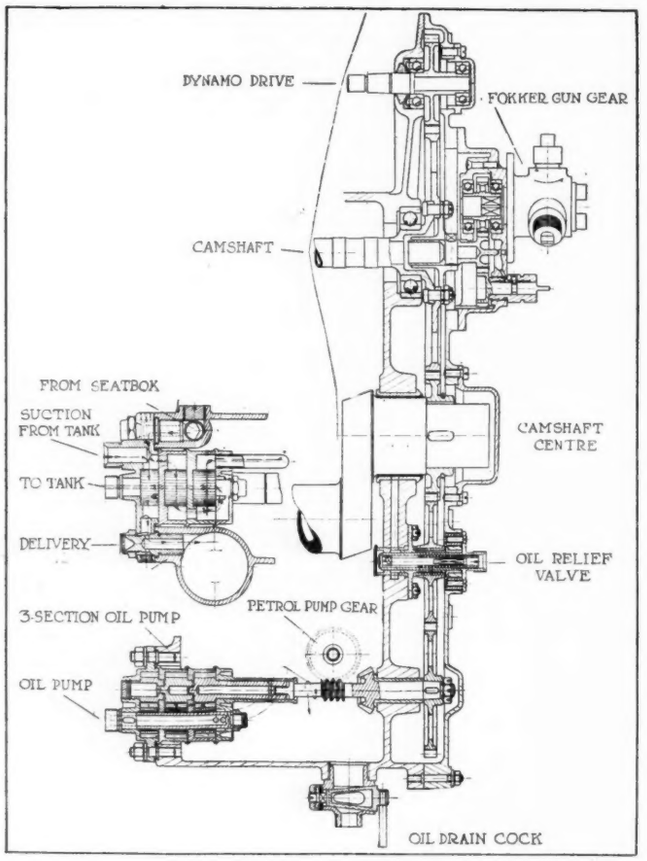
End view of 300 hp. engine

Besides the 160-hp. model for school machines and 200-230-hp. type for war aircraft, the Benz people early, though admittedly after the introduction of the Hispano-Suiza aero engine that the Germans for some time thought of copying, were out to produce a high-speed model for scouts, which was long used without reduction gear for quick production, as many difficulties were experienced in finding the right steel to avoid quick wear of the gears. Besides the 185-hp. six-cylinder vertical edition a 195-hp. eight-cylinder Vee type with reduction gear was further turned out as a power plant for scouts, and when the Benz company produced at the end of the war one of the most complete ranges of models they all were of the Vee type, as evident from specifications.

The most notable innovation of the later Benz engines is the introduction of weight-saving steel cylinders. In spite of a moderate compression ratio and sufficient lubrication seizing of the cast-iron pistons was feared, unless each piston was ground in its own cylinder, which procedure goes against quantity production. The Benz people have followed up the introduction of aluminum pistons even in car design, thus doing away with later grinding in of the cylinders, and thereby with one of the main objects against cylinders cast in pairs. The separate interchangeable cylinders are set deep into the crankcase and are provided with liners of wrought steel that are screwed into the cast-iron valve heads. The latter have a slight taper, water tightness being further assured with cement, the excess of which is pressed out through holes drilled in advance. The water jacket is of 1 to 2 mm. steel sheet, welded on, and the plug sockets are welded into the top of the liner. Bearing four lugs for fastening bolts the cylinder flanges are cut down to the lightest possible form.

The pistons are cast in an outer die with an inner sand core, a normal zinc and copper alloy being employed. The strengthening webs are neatly arranged and the domed piston head is notable.

**Mr. Hildesheim is a well-known aeronautical writer of Copenhagen and is now visiting in the United States.*



Cross section of auxiliary drive

Each cylinder is fitted with one inlet and two outlet valves that are actuated by a central camshaft between the two rows of cylinders. The twin inlet valve springs are also a departure from earlier Benz practice; they are partly sunk into the cylinders, so that the rocking levers of the inlet valves can be mounted inclined below the twin ones of the outlet ones. For adjustment of the valve clearance suitable set screws are provided. The push rods are seamless tubes with ball pivots in both ends.

As the aero engines with overhead camshafts continue to increase in popularity it is worth while commenting upon the simplicity of lubrication of the rocking levers as well as their accessibility and that of the springs and valves compared with the enclosed camshaft of the former type. As early as the Kaiser Prize winning model, ball bearings were mounted in the rocking levers and have later been adopted in other types too. Occasional refilling with grease during overhauls is all that is required.

The camshaft can be removed together with its five bearings after removing the push rod guides and the stop screws of the bearings.

The pistons are provided with ample steel gudgeon pin bushings, allowing an ample surface for the connecting rod on the pin. Four small iron piston rings are fitted; another feature is the scraper ring that is used in addition for balancing small differences in piston weights.

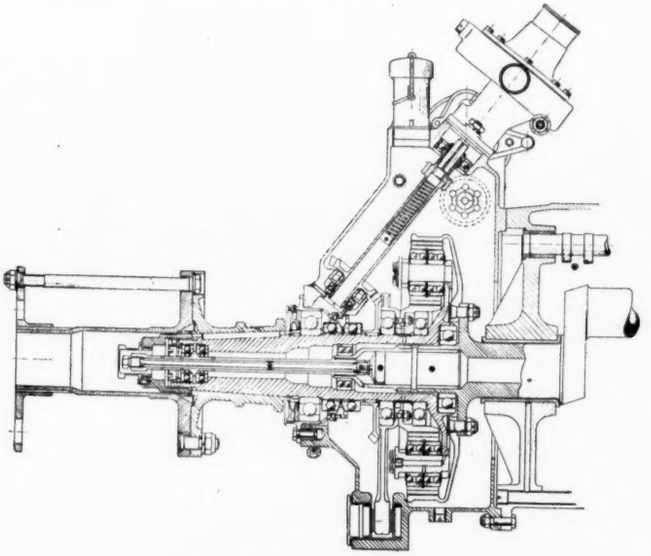
The master and auxiliary connecting rods of the 300-hp. Benz engines and the master rods of the 500-hp. models are of circular section, drilled through from the gudgeon pin end, while the auxiliary rods of the latter, running on a bronze bushing on a pin that is held on the master rod in two eyes, has T-section and lightened by drillings.

The arrangement of the various auxiliaries indicates an endeavor to keep the overall length down to a minimum and the propeller end clear when the engine is mounted in the aircraft. For this reason the two twin carbureters of the Claudel type are fitted with water jackets, each feeding three cylinders; the wireless dynamos, driven from the camshaft, are mounted between the cylinder rows, and the water, petrol and oil pumps at the rear end, being accessible from the pilot's cockpit.

Instead of the previous Benz practice of oil circulation from a sump to which small quantities of fresh oil are added, the dry sump system has been adopted, as the fear of quick wear of the bearings from foreign particles has not been justified in car design, and the oil is furthermore renewed more often in aero engines. Also the complicated piston pump has been replaced by the more simple gear type. Here again the fear of insufficient side tightening was unnecessary, as so much oil never ran away as to cause starting troubles and so a special spring loaded piston safeguard could be done away with. Mounted at the lowest point of the crankcase, one of the triple oil pumps sends the oil from a collecting tank to the distribution piping, mounted outside on the case and being thus easily accessible for cleaning. The pipes are connected with the main bearings of the crankshaft, another reason for the exterior position being the difficulties experienced in avoiding porous castings and so oil leakage, when casting the oilways into the aluminum.

From the main bearings the oil is forced to the crankpins through the bore of the crankshaft and on through tubes in the interior of the connecting rods to the hollow gudgeon pins, whence the excess deposits on the cylinder walls. The regular lubrication is recorded by a pressure gage on the distribution piping; the pressure must not fall below 0.5 atmosphere (7.5 lb. per sq. in.). Two further pumps draw the used oil from the engine, forcing it back to the tank, one from the front and the other from the rear of the crankcase, the object being to prevent overlubrication of the front and rear cylinders when climbing or diving.

Benz provides a special oil tank for mounting in the fuselage so that the corrugated surface forms part of the body wall and is thus efficiently air-cooled. Owing to an intermediate wall the oil enters chiefly the tank jacket, where it is highly cooled. Should it, however, freeze or the tank be full the oil overflows into the inner part of the tank. The tank must be fitted with an air valve of 5 cm. diameter, placed so as not to allow oil to leave either while climbing or diving. Breather pipes are fitted to the crankcase on both sides below the cylinders and lead to horizontal header pipes connected to tubes leading down into the open, fitted with oil traps.



Cross section of reduction gear

A special petrol tank and pump system, based upon long experience, is also employed. The tank is split up into two parts, *A* and *B*; the filler cap in *B*, which must be filled before petrol reaches *A*. Besides the fuel pump, driven by the engine, a hand pump is provided, and on the piping a fuel cleaner and the relief valve are fitted. The excess petrol enters a tank through the latter, from which it returns either to the main tank *A* or the auxiliary one *B*.

The fuel pump is of the single acting piston type, with an aluminum case with a bronze liner, into which the piston is ground, containing also the combined filter and water separator with detachable bottom, two valves being mounted outside. The fuel pump is driven slowly by worm drive from the valve gear, supplying the fuel to the carbureters at 0.2 to 0.25 at pressure. Glycerine was originally used as a pump lubricant, but it was found in duration tests that occasional filling of the interior of the piston sufficed for a reliable direct suction of the fuel of the latter, as glycerine was difficult to procure.

The circulating water pump is of the ordinary centrifugal type and is driven in the 195-hp. model from the reduction gear in inverted position, being in the other models set below the crankcase and driven by bevels from the oil pump shaft. The water pump shaft rests at top in balls and is supported by a special thrust bearing, at bottom in a bronze bushing. Central inflow and split outlets, one for each cylinder, are provided.

The spur wheel reduction gear caused many difficulties, as the teeth were apt to wear out in spite of ample dimension, and Benz was the first to bring out a reliable gear besides Rolls-Royce, four planetary wheels being here employed, carried on a spider fixed to the airscrew shaft. The internally toothed ring is carried by a flange on the crankshaft end, and the central gear on a pivoted arm from the gear box case, the airscrew running on ball races within it. The pivot permits the central gear to give to small vibrations of the airscrew shaft, and the pins with interposed double row ball races that carry the four planetary gears have slightly eccentric ends fitting the spider arms. This arrangement allows of a very accurate adjustment of the wheels to insure even load distribution among them. Aiming at simplicity a one-stage reduction only is employed, the airscrew speed being thus higher than usual with reduction gear practice, that is, 1180 r.p.m.

From the specifications appended of the Benz aero engines the trend of supplying the same engine super compressed and dimensioned with a certain constant performance is apparent. It is apparent that time was not found to try out the 500-hp. models with reduction gears; so far they are only known to have been used in the 1500-hp. Staaken giant biplanes built at the Aviatik works and the 300-hp. model in a pursuit biplane of the same company.

Specifications of Benz Aero Engines

	Bz 3a V	Bz 3b V	Bz 4	Bz 5b	Bz 5‡	Bz 6	Bz 6V
Normal Horsepower ..... hp.	185	195	200	300	300	500	500
No. of Cylinders	6	8	6	12	12	12	12
Bore ..... in.	5.5	5.31	5.7	5.31	5.7	5.7	6.1
Stroke ..... in.	7.48	5.31	7.48	5.9	6.69	7.87	7.87
Cylinder Arrangement	vert.	V-90	vert.	V-60	V-60	V-60	V-60
Normal output at ground level ..... hp.	195	200	225	300	320	500	575
Output normal up to— ..... ft.	7550	9190	5800	8530	9850	5800	5800
Normal r.p.m. of crankshaft at ground level	1400	1800	1400	1800	1500	1400	1500
Maximum output at ground level (only in emergency and for short periods) ..... hp.	250	275	275	400	450	625	675
R.p.m. of crankshaft at maximum output at ground level	1500	2000	1500	2000	1700	1600	1700
With or without dynamo drive	with	with	with	with	with	with	with
Fuel consumption per hp/hr ..... lb.	0.474	0.485	0.496	0.496	0.496	0.496	0.496
Oil consumption per hp/hr ..... lb.	0.026	0.033	0.026	0.026	0.026	0.033	0.033
The amount of heat per hp/hr to be dissipated by radiator ..... kg/Cal	430	430	430	430	430	430	430
With or without reduction gear	no	with	no	with	with	no	no
Reduction ratio of the gear	——	29/19	——	29/19	29/17	a flange for mounting on crankcase	
Normal r.p.m. of the propeller	1400	1180	1400	1180	985	——	——
Weight of engine (without propeller hub, dynamo, exhaust pipes, oil or water) ..... lb.	606	683	816	948	1056	1486	1531
Water content of engine ..... lb.	22	22	28.6	35.3	39.7	72.7	77
Oil content of the engine ..... lb.	0	0	6.51	0	0	36.4	36.4

‡This model has not been put into production so far.

Speakers at the S. A. E. Summer Meeting

Col. E. L. Gorrel talked on aircraft — *C. M. McCreary of Goodyear* — *Geo. A. Weidley, engines* — *Col. G. A. Green of the New York bus lines* — *John A. McGeorge of Ohio Blower* — *Geo. L. Lavery, steel castings* — *C. S. Crawford, Premier* — *D. L. Gallup, engines*

The Proposed Worm Gear Standards of the A. G. M. A.

An abstract of the report presented by Mr. J. C. O'Brien at the recent meeting of the American Gear Manufacturers' Association is given here. These standards cover the range in pitch from ¼ in. to 2 in. in single as well as multiple threads and 10:1 to 100:1 ratios inclusive.

By P. M. Heldt

A REPORT on standardization of worm gearing of the general industrial range was made at the spring meeting of the American Gear Manufacturers Association at Detroit, by Joseph C. O'Brien, chairman of the Worm Gear Division of the Standards Committee. In his investigation of the subject Mr. O'Brien found that for purposes of standardization it was necessary to distinguish between several classes of worm gearing: the present recommendations cover a range of (axial) pitches of from ¼ in. to 2 in. The class covering worm gears with pitches up to ¼ in., to be known as the small pitch industrial range, is to receive separate consideration.

One of the first questions that arose was whether the diametral or the circular pitch system should be used, and the conclusion was reached that the circular pitch system is preferable for worm gears. A series of eleven pitches between the limits mentioned was suggested for standardization. These pitches are as follows: ¼, 5/16, ⅜, ½, ⅝, ¾, 1, 1¼, 1½, 1¾, 2 in.

A compilation has been made of the worm hobs owned by member companies of the A. G. M. A. and it was found that of 310 hobs listed, 51.2 per cent were single thread, 24.8 per cent double thread, 10.6 triple thread and 10.3 per cent quadruple thread, while only 3.1 per cent were hobs with more than four threads. As regards pitches, of 282 hobs listed, 25.2 per cent were of ¼ in. pitch; 26.5 per cent ½ in.; 32.7 per cent 1 in.; 15.6 per cent 2 in. It was on the basis of this data that it was decided to limit the recommendations to worm gearsets of from ¼ in. to 2 in. pitch inclusive, single to quadruple threads inclusive and 10:1 to 100:1 ratios inclusive.

Fig. 1 is suggested as a conventional form of sketch for a worm and wheel. This is quite simple and may be readily drawn freehand. When properly dimensioned, it gives complete manufacturing data in a majority of cases.

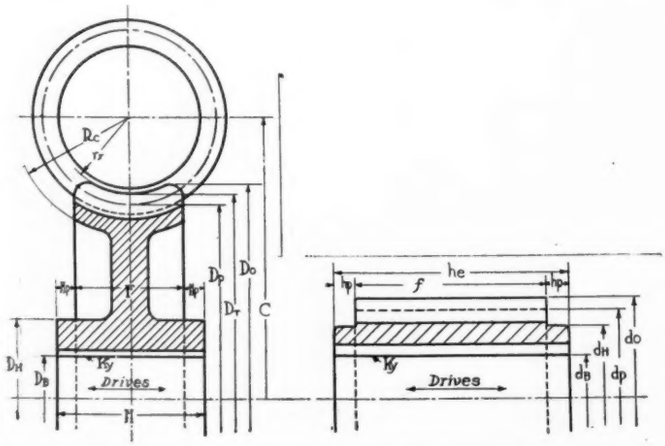


Fig. 1—Conventional sketch of worm and wheel

A system of symbols and nomenclature was given in the report and was recommended for adoption as a standard for use in discussions, formulæ, etc. Attention is directed to the fact that dimensions of the wheel are designated by a capital letter and supplemented by a sub-letter, which, as far as possible, has been selected so as to give a clue to the particular dimension referred to; for instance, *Dp* = Pitch diameter of wheel, *Do* = Outside diameter of wheel. In a like manner, the small letters of the alphabet, together with a sub-letter, are used to designate dimensions of the worm. A part of the proposed nomenclature and system of symbols is given below:

Standard Nomenclature

Symbols	Terms
DP	Diameter of pitch circle of worm wheel.
dP	Diameter of pitch circle of worm.
Do	Outside diameter of worm wheel.
do	Outside diameter of worm.
DT	Throat diameter of worm wheel.
dT	Diameter at root of thread of worm.
DB	Diameter of bore in worm wheel.
dB	Diameter of bore in worm.
DH	Diameter of hub of worm wheel.
dH	Diameter of hub of worm.
HL	Hub length of worm wheel.
hl	Hub length of worm.
HP	Hub projection of worm wheel.
hP	Hub projection of worm.
F	Face of worm wheel.
f	Face length of worm.
Ky	Keyway of worm wheel.
Kw	Width of keyway in worm wheel.
Kd	Depth of keyway in worm wheel.
ky	Keyway of worm.
kw	Width of keyway in worm.
kd	Depth of keyway in worm.
Hn	Number of holes in web of wheel.
Hd	Diameter of holes in web of wheel.
Hc	Diameter of circle on which holes in web are evenly spaced.
rt	Radius of curvature of worm wheel face.
Rc	Radius of curvature of inside of worm wheel rim.
RP	Radius of worm wheel pitch circle.
Ro	Radius of outside circle of worm wheel.
Rt	Radius of throat circle of worm wheel.
Rr	Radius of rim at edge of face.
rP	Radius of worm pitch circle.
ro	Radius of outside circle of worm.
rr	Radius of root circle of worm.
R/M	Revolutions per minute of worm wheel.
r/m	Revolutions per minute of the worm.

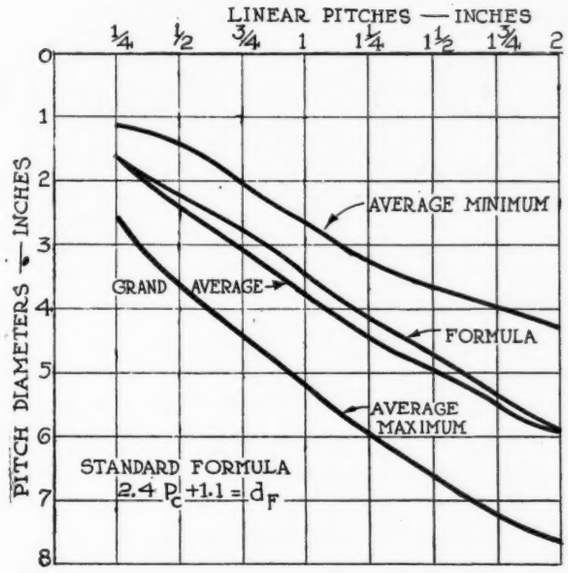


Fig. 2—Relations between pitch diameter and linear pitch

N	Number of teeth in worm wheel.
n	Number of threads in worm.
C	Distance between centers of worm and worm wheel shafts.
Pc	Circular pitch.
Pl	Linear pitch.
Pne	Normal circular pitch.
Pn	Normal linear pitch.
tt	Tooth or thread thickness taken at the pitch line circle normal to the thread.

With such a system of symbols, which in themselves are (in a measure) self-explanatory, engineers who are not so closely identified with the gear industry will be able to follow the derivation and explanation of rules and formulæ with a minimum mental effort.

The pitch diameter of any worm may be defined as the diameter of a circle about the axis of the worm which lies tangent to the pitch surface of the worm.

The pitch surface of the worm may be defined as the plane which lies tangent to the pitch cylinder of the worm wheel and perpendicular to the worm axial plane.

The worm wheel pitch cylinder may be defined as a cylinder of such diameter that a point in its circumference has the same linear velocity as the translated velocity of the worm tooth section.

Putting the last statement in the form of an equation in terms of standard symbols, we have

$$Dp\ R/M = L\ r/m \quad \ldots\ldots (1)$$

from which we may derive

$$Dp = L\ \frac{r/m}{R/M} \quad \ldots\ldots (2)$$

as the equation for the diameter of the worm wheel pitch cylinder.

As twice the center distance equals the sum of the pitch diameters, we have

$$dp = 2C - L\ \frac{R/M}{r/m} \quad \ldots\ldots (3)$$

as the equation for the pitch diameter of the worm.

The equation shows that the pitch diameter of the worm depends upon the center distance. In general practice the pitch surface of the worm is practically always located at the middle of the standard working depth in the worm axial plane.

From one point of view, small pitch diameters are desirable, but from another there are objections against making the pitch diameter too small. There must be sufficient stock between the root of the threads and bottom of the keyway. If the thread angle becomes too great, interference is encountered in generating the wheel teeth, the matter of manufacturing a satisfactory hob becomes more difficult, the permissible width of worm wheel face is limited, difficulty is encountered in milling the worm threads, and also in grinding the threads.

In order to determine what the general practice is, data were compiled from the hob lists of five companies. Fig. 2 shows the relation between the circular pitch and pitch diameter for the average minimum, average mean and average maximum pitch diameters listed. The curve for the average mean diameters closely approximates a straight line whose equation is

$$dp = 2.4\ Pc + 1.1 \text{ in} \quad \ldots\ldots (4)$$

This formula is recommended as a standard for future design.

The relation between the circular pitch and the sizes of hole recommended is represented in Fig. 3, which shows the sizes plotted and a curve drawn through same. The dotted line represents the actual fractional dimensions and the full line has been plotted from the equation.

$$\text{Max. } d\,B = 1.75\ \sqrt{Pc} \quad \ldots\ldots (5)$$

This equation is recommended as a standard for future design in connection with the recommended pitch diameters. The curve whose equation is

$$\text{Min. } d\,B = 1.5\ \sqrt{Pc \text{ in}} \quad \ldots\ldots (6)$$

has also been plotted and is suggested as a standard formula for the minimum size of bore in connection with the pitch diameter recommended.

It is suggested that in the case of standard worms, single and double threads be proportioned from the linear pitch, and in terms of standard symbols we have

$$a = 0.3183\ Pc \quad \ldots\ldots (7)$$
$$td = 0.6866\ Pc \quad \ldots\ldots (8)$$

as the formulæ for the addendum and whole depth respectively.

The greatest thread angle for any double thread worm suggested as standard is 12 deg. 11 min., and for this angle there is only a difference of 2 per cent between linear and normal proportions.

It is also suggested that the hobs for single and double thread worms of standard dimensions be fluted parallel with the axis. Brown & Sharpe make the flutes parallel with the axis up to an 18 deg. thread angle.

In the case of triple and quadruple thread worms of standard dimensions it is recommended that the tooth

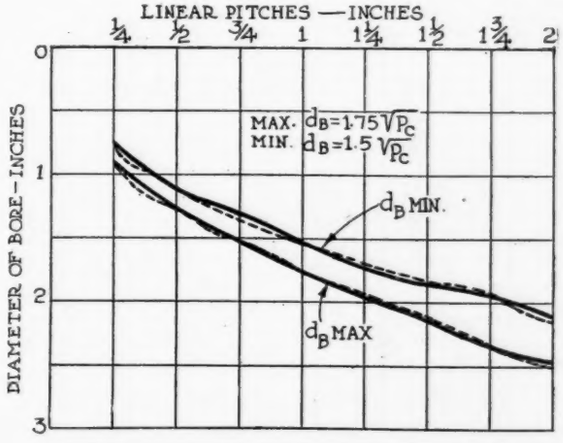


Fig. 3—Relation between bore and linear pitch

depth proportions be made 0.9 of the proportions based on the linear pitch and in terms of standard symbols we have the following formulæ

$$a = 0.2865\ Pc \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

$$td = 0.6179\ Pc \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

for the addendum and whole depth respectively.

It is also recommended that the hobs for triple and quadruple thread worms of standard dimensions be fluted normal to the thread angle.

When the term pressure angle is used without modification the pressure angle of the normal space section at the pitch line is referred to. It is assumed that the standard worms for which recommendations are made will be manufactured by the rotary cutter process, using a straight sided cutter. In order to gain a clear perspective of the

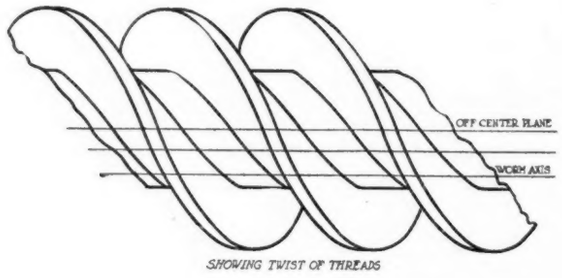


Fig. 4—Twist of threads of worm

reason why a higher pressure angle is advisable under certain circumstances, let us assume a hypothetical case in which the combination of pitch diameter and lead is such that the teeth have a great thread angle. Such a worm when viewed from directly above would appear as shown in Fig. 4. It should be observed that the farther we go from the axial plane the more twisted the teeth become. The teeth may be so twisted that the worm could not be set radially into mesh with a wheel generated by the tangential feed-method, or if the wheel is hobbed by feeding the hob radially into the blank, a portion of the working curve of the wheel teeth will be milled away through interference of the hob. The cutting teeth of the hob when in a certain position are apt not to have sufficient clearance, which will limit production and also shorten the life of the hob.

If the pitch diameter and lead are fixed, and therefore the thread angle is determined, we have only three courses open whereby we may avoid or minimize these conditions: We may reduce the face of the wheel to a line; we may

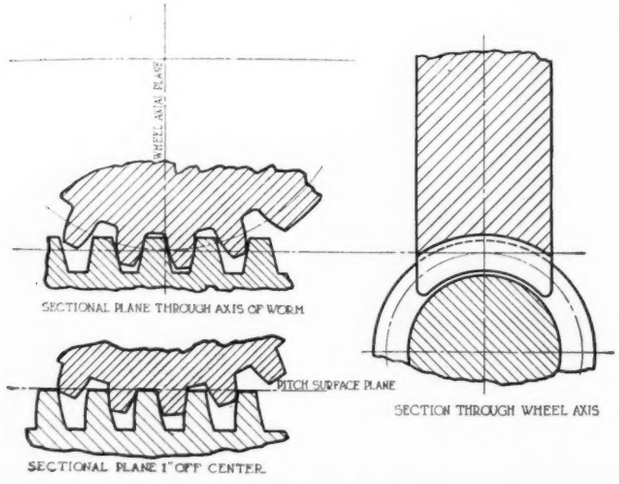


Fig. 5—Central and off-center sections

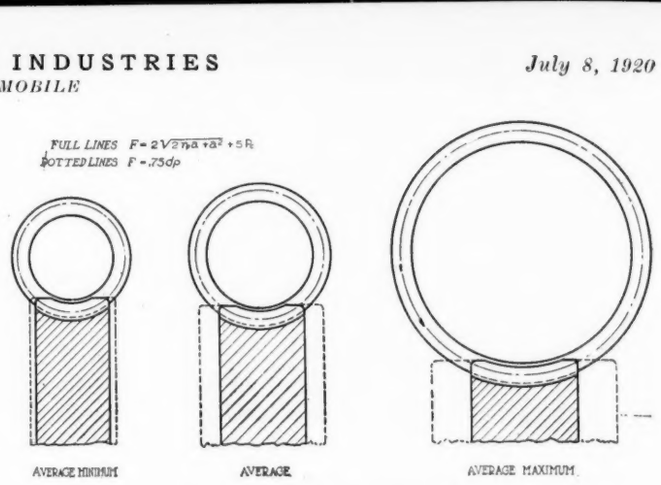


Fig. 6—Widths of wheel face

limit the height of the teeth, or we may increase the pressure angle of the teeth enough to eliminate such conditions; there is, of course, the further possibility of using a combination of these methods.

From a theoretical viewpoint, low pressure angles are advisable. It is also advisable to use as wide a gear face as practical. It is recommended for future design that standard worms be made with a 14½ deg. pressure angle for single and double threads and 20 deg. pressure angle for triple and quadruple threads in combination with other dimensions recommended.

The pressure angles suggested have already been demonstrated as satisfactory for the sizes and ranges which they are intended to cover.

When shaft worms and worms having five or more threads are considered, higher pressure angles will probably be found advisable.

The most important consideration in arriving at an advisable face of wheel is that the teeth should have

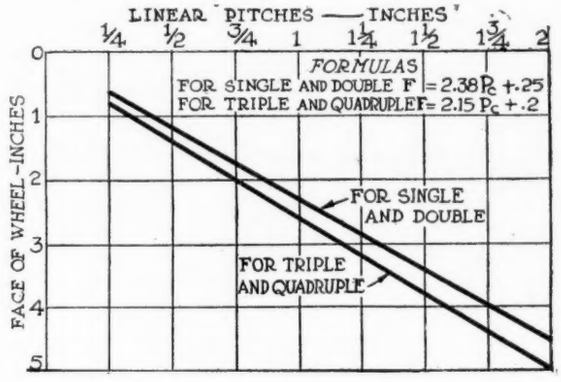


Fig. 7—Width of wheel face vs. linear pitch

continuous action in all planes parallel to the axial plane on both sides of the center-line.

Fig. 5 shows the engagement of the teeth in the axial plane and also the engagement in a parallel plane 1 in. off center. The pitch line of the teeth lies at the root of the teeth in the off center plane. Note that the contact ceases at the pitch line in this plane, and all of the contact obtained in this plane occurs during the approach.

If we were to continue to increase the face of this particular wheel and take a sectional plane farther from the center, the line of action would be decreased on the high pressure angle side of the tooth, for two reasons. First, contact would cease before the point of contact reached the line of centers, and, second, the distortion of the teeth would be greater and the line of action would intersect the outside circle of the wheel sooner, hence the line of action would be decreased at both ends. When we reach

a plane where the line of action becomes so short that the teeth do not have continuous action in that plane, we cannot obtain additional contact for certain stages of mesh, by further increasing the face, and where additional contact is obtained for certain other stages of mesh, the contact occurs during the approach, is of short duration and the contact surface of the wheel teeth is composed of quite pronounced flats as compared with the contact surface in the region of the axial plane.

Mr. O'Brien recommends the following formula:

$$F = \sqrt{d\,P\,a + a^2} + 0.5\,Pc \quad \ldots\ldots (11)$$

in the case of single and double thread worms, and

$$F = \sqrt{d\,P\,a + a^2} + 0.25\,Pc \quad \ldots\ldots (12)$$

in the case of triple and quadruple thread worms.

These formulæ are suggested as Recommended Practice for use with existing hobs.

Fig. 6 shows the minimum, mean and maximum pitch diameters of present ¼-in. pitch hobs, drawn to scale and the face recommended drawn in full lines. A majority of the members of the A. G. M. A. seem to favor a wheel-face equal to 75 per cent of the worm pitch diameter. Such faces are shown dotted in the figure. It should be observed that in the case of the maximum and average diameters, the teeth would become pointed before the edge of the face is reached.

It is, therefore, evident that a fixed percentage of the pitch diameter is not the proper basis for proportioning the face of the wheel where a variety of diameters are in use.

The relations between the recommended faces and circular pitches are shown in Fig. 7. The equations of these curves are as follows:

For single and double thread worms,

$$F = 2.38\,Pc + 0.25 \text{ in} \quad \ldots\ldots (13)$$

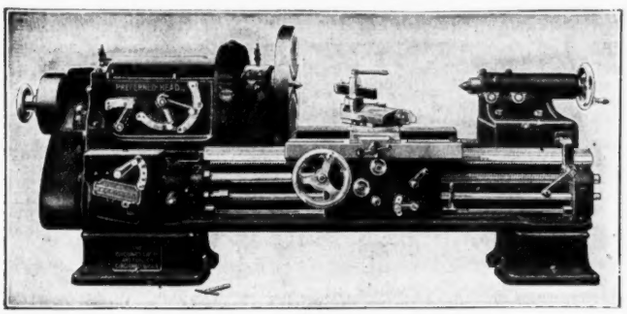
and for triple and quadruple thread worms

$$F = 2.15\,Pc + 0.2 \text{ in} \quad \ldots\ldots (14)$$

Geared Head Lathes

THE Cincinnati geared head lathe shown in the cuts herewith is a general manufacturing tool fitted with a hexagon turret on the bed, power feed and silent chain drive. As the speed variations are obtainable in the head, constant speed motors only are required. This lathe is made in 16, 18, 20, 22, 24, 26 and 28 in. sizes, with either single pulley belt drive or motor drive.

Levers at the front operate all feed changes. The index plate gives the lever positions for each speed. For instance, to obtain 12 r.p.m. the lever position would be 3-B-C. For 305 r.p.m., 2-A-D. A neutral position is also



Cincinnati geared head lathe

provided, permitting of revolving the spindle by hand for chucking similar jobs.

The spindle is made of a high carbon crucible forging. It carries only the face gear and one direct driving gear operated by a lever. The intermediate shaft has three sliding gears and three stationary gears of different diameters. The drive shaft, operating at constant speed, consists of two sliding gears meshing with gears on the intermediate shaft. When the gear to the left on this shaft is in mesh with the gear on the intermediate shaft, it gives the six lower changes of speed. When meshing the gear to the right on this same shaft the six higher speeds are secured. Shafts in this head are of high carbon nickel steel.

All gears on the back gear shaft, as well as the direct driving gears, are made of steel forgings, heat treated. All of the others are of high carbon nickel steel and run in bronze bushings. The teeth of the gears are rounded. Only the gears actually used for driving are in mesh at any time, thus obviating unnecessary loss of power.

All bearings and gears, including those not in use, are oiled automatically by the splash system. Indicators always show the amount of oil in the base and head. Oil is properly distributed by the gears to grooving provided in the top cover. The rotating shaft bearings, therefore, are kept oiled.

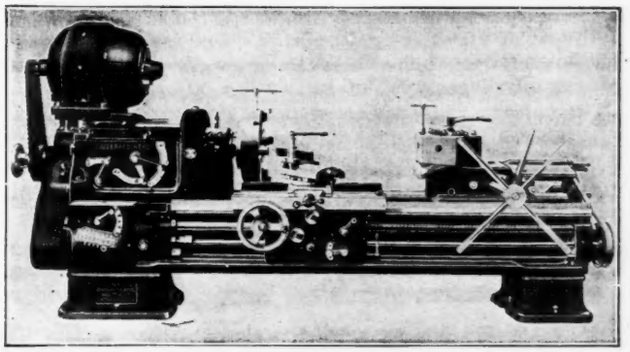
The second cut shows the Cincinnati patented geared head lathe for a single pulley belt drive, driven direct from the line shaft, or direct connected to the motor drive. The motor is mounted either on the headstock or in the rear of the cabinet leg, the lathe being driven through belting, silent chain or gearing.

Twelve mechanical speed changes in geometrical progression are secured on these lathes, all through sliding gears, by simply shifting three levers. The point is made that the operators have no excuse for not using the correct speeds and feeds for the most efficient results. No safety device is necessary, as the levers and gearing are so arranged as not to permit them to lock while operating. Any lever can be shifted without interfering.

The index plates are simple and can be easily read. At the apron is a control by which the spindle may be stopped, started or reversed without stopping the overhead works or the motor.

The design of these lathes is similar to the cone type of the same concern, but by the use of a gear drive for the spindle the machine is rendered suitable for use as a production tool rather than tool room work.

The standard equipment furnished is the same as with the other type, except for the countershaft, which is not needed. Such extra attachments as taper, draw-in, turrets, chucks, lathe tools, etc., may be added at any time.



Geared head lathe for a pulley belt drive

The General Causes of Failure of Spark Plugs

This report analyzes the possible causes of defective spark plug action due to design and suggests remedies for the difficulties. The data has been obtained from tests on many varied designs and from reports from France. The present day plug can undoubtedly be much improved.

By F. B. Silsbee*

THE characteristics of the ignition system used in aviation gasoline engines are such that only a certain maximum voltage can be produced by the system even on open circuit, and if the insulation between the spark-plug terminals is reduced the maximum voltage is correspondingly reduced and no spark will occur if the insulation is too low. The requirements which a spark plug must meet are, therefore,

1. The maintenance of a gap having a breakdown voltage of about 6000 volts.
2. The maintenance of an insulation resistance of at least 100,000 ohms.
3. Practically complete gas tightness.

These requirements must be maintained under pressures of 500 to 600 lbs. per sq. in. while immersed in a medium which alternates rapidly in temperature between 0 and 2500 deg. C., and in an atmosphere which tends to deposit soot upon the surface of the insulator. The various manners in which a spark plug may become inoperative may be enumerated as follows:

1. Fouling with carbon deposit causing short circuit.
2. Fouling with oil deposit causing open circuit.
3. Breaking of the insulator.
4. Preignition.
5. Conduction through the insulator.
6. Electrical puncture of the insulator.
7. Minor trouble, such as warping and breaking of electrodes, etc.

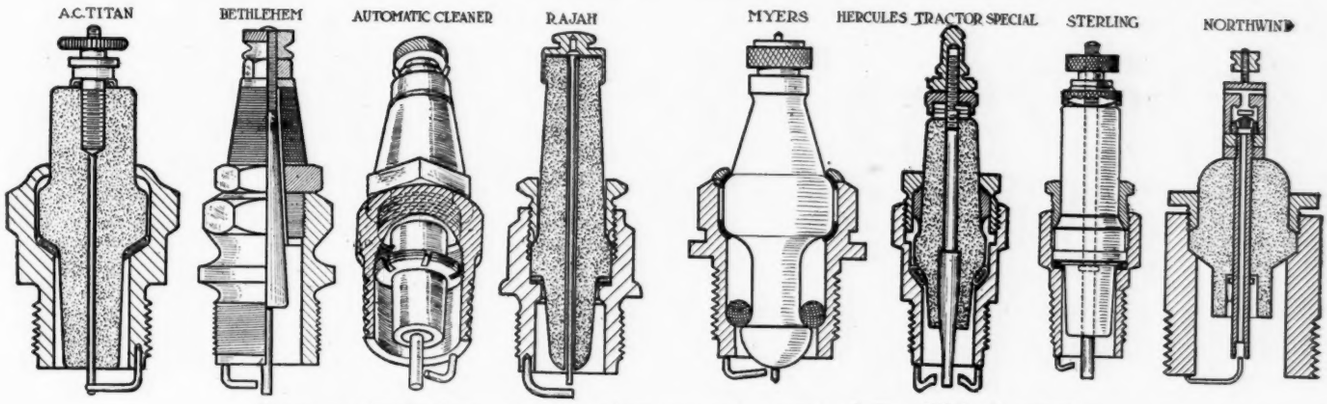
Experience in the altitude laboratory at the bureau and authoritative information received from France indicate that the first type of failure accounts for over 50 per cent of the trouble encountered in practice, particularly at high altitudes; the third type of failure accounts for nearly 40 per cent of the trouble; the second type of failure occurs quite frequently when first starting an engine, but very seldom develops after the engine is once running. The other types of failure are of relatively rare occurrence, but must be kept in mind in the design of spark plugs, since departure from the conventional designs is very liable to produce one or another of these types of failure.

The voltage required to produce a spark in the cylinder of a high-compression aviation engine is approximately 6000 volts. Consequently, when the spark plug is clean, there is a considerable factor of safety. If the plug is shunted by even a very high resistance, the maximum voltage reached is materially reduced and with a lower value of resistance than about 100,000 ohms, the voltage may be insufficient to produce a spark. The magnitude of the effect of a shunting resistance may be estimated from the relation that the voltage across the plug previous to the passage of the spark is equal to the product of the shunting resistance by the current flowing through it. Thus, for example, if the secondary current of the coil is limited to 0.08 ampere and the shunting resistance is 50,000 ohms, the maximum voltage available is only 4000 volts and no spark will occur. The requirements of the spark plugs are, therefore, to maintain a gap the sparking voltage of which does not greatly exceed 6000 volts, and to maintain an insulation resistance across this gap which is considerably greater than 100,000 ohms. The plug must also be gas tight under the conditions of pressure and temperature existing in the engine.

While much remains to be learned as to the conditions existing in modern aviation engines, the pressures and temperatures met with are roughly as follows: The pressure on the plug alternates between a slight suction during the intake stroke and a pressure of 500 to 600 lb. per sq. in. during the expansion stroke. There is a considerable vibration of the engine as a whole, which is at times sufficient to crack porcelain insulators. In rotary engines the centrifugal force acting on any insulators near the periphery may exceed 500 times the weight of that part. The incoming charge of gas mixture during the intake stroke may be several degrees below zero in cold weather or at high altitudes, while the flame of compressed and burning gas which surrounds the plug during the expansion stroke may reach a temperature of 2500 deg. C. These alternations of pressure and temperature occur with a frequency of about 15 cycles per second, and the fluctuations in temperature cannot penetrate to any appreciable depth in the insulating material of the plug. The resultant effect is that the inner end of the insulator and central electrode reach an average temperature of approximately 900 deg. C.; the body of the insulator well up in the shell seldom exceeds 200 deg. C.; and the shell itself is in contact with a jacket containing water at 70 deg. C.

Fouling by Carbon Deposits.—This trouble is due to the deposit of a layer of carbon upon the surface of the insulator or to the formation of a cake of carbon immediately between the electrode surfaces. This carbon is due to two causes: (*a*) The chilling of the flame by a cool portion of the plug, which thus renders combustion incomplete. This effect is particularly common when the mixture of gasoline and air is too rich in gasoline and is consequently of frequent occurrence in operation at high altitudes in cases where the carbureter is not properly compensated for the decrease in density of the atmosphere at those altitudes. (*b*) The second cause for

*From Report No. 51 of the National Advisory Committee for Aeronautics.



These sectional views of spark plugs are not a part of Dr. Silsbee's report

carbon deposit is from the decomposition of lubricating oil which may be splashed or sprayed on heated portions of the insulator. The lubricating oil itself is an electrical insulator, and when it wets a layer of soot on the spark plug it tends, by surrounding each particle of carbon, to make the entire mass an insulator. Gradually, however, such a deposit chars under the action of the flame and becomes more and more conducting.

In this process the oil acts as a binding material for the soot and also increases the rate of deposition, because particles of carbon in the flame may adhere to the oily surface instead of remaining in suspension in the flame and burning later in the stroke. The conduction through the deposit thus formed seems to take place along a narrow path where the oil film between the particles has been broken down by the electric stress rather than as a uniform conduction over the whole surface of the insulator.

This trouble seems to be the most frequent source of failure of spark plugs. Records kept in the altitude laboratory show over 50 per cent of the spark plug troubles to be due to this cause.

The reports from France also corroborate this statement. As would be expected, the trouble is more serious at high altitudes than at low, and seems to occur more readily with mica than with porcelain plugs. This is probably due to the somewhat rough surface of the mica, which causes the carbon to adhere more readily.

While the engine is in operation, such fouling causes misfiring of the cylinders, or, in case there are two plugs in one cylinder, one of which remains clean, there is merely a slight loss in engine power. On removing the plugs from the cylinder a heavy deposit of carbon is at once evident. It should be noted that spark plugs may appear very black and heavily sooted and yet show a high resistance, owing to the fact that the carbon particles are not in direct contact but may be insulated with a film of oil. After long use porcelain insulators frequently take on a film of reddish-brown color, which, however, does not tend to short circuit the plug and which must be distinguished from fouling with carbon.

The possible remedies for this type of failure lie (*a*) in improving the design of the plug, (*b*) in improving the carbureter system, and (*c*) in modifying the ignition system.

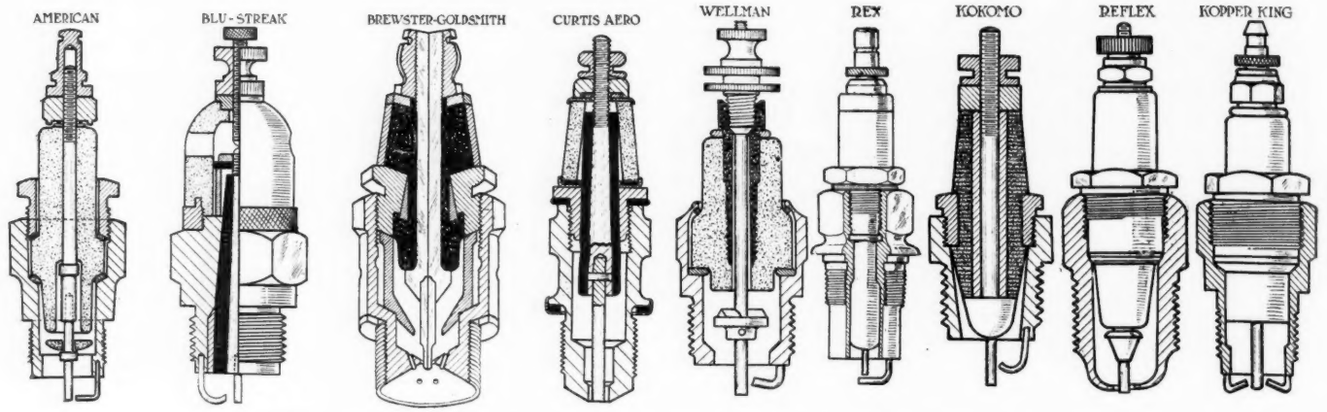
Prevention of Carbon Deposits.—(*a*) The insulator of the spark plug may be so shaped by the use of petticoats, ridges, or a long conical projection that a portion of this surface operates at a very high temperature. With this arrangement all carbon deposit is burned off during the early part of the combustion of the charge, while the gas in the cylinder still contains an excess of oxygen. This type of construction is particularly useful in engines which are well cooled, but in engines which are very hot and of high compression normally, this construction may tend to cause preignition. An alternative method of design is shielding the insulator with a metal baffle plate, which prevents the access of oil and its resulting carbonization. This is useful in engines in which a large amount of oil is used, or in which the plug is so located as to be particularly exposed to a spray of oil. With this construction, however, there is usually little opportunity for a carbon deposit to be burned off, and if such a plug happens to become fouled at light load or high altitude, it will not come back into service at full load or low altitude.

(*b*) It is probable that the development of new types of carbureters which is now in progress will greatly reduce the occurrence of excessively rich mixtures in planes flying at great altitudes and will thus tend to reduce this source of trouble.

(*c*) Certain special types of ignition systems have been devised which are particularly suited for firing plugs which are shunted with a fairly low resistance. The usual arrangement of such systems is to connect an auxiliary spark gap in series with the spark plug. With devices of this type, it has been found possible to produce regular firing in an engine in which the plugs were deliberately fouled so as to have an insulation resistance of only 5,000 ohms.

Fouling with Oil.—This trouble occurs in cases where the lubricating oil forms a coating over the surface of the electrodes or forms an actual drop between the electrode points. Since the breakdown strength of oil is several times that of air, the voltage required to produce a spark under these conditions is very greatly increased and may exceed the voltage which the ignition system is capable of delivering. If the insulation of the spark plug is at the same time somewhat reduced by the presence of soot, the maximum voltage which the system will give is correspondingly reduced.

This trouble usually occurs when there is an excessive amount of lubricating oil in the cylinder, and this condition arises most frequently on starting an engine when it has been turned over several times with no flame in the cylinder which might serve to burn off the film of oil. The condition is also met with when the plane is recovering from a long glide, during which the engine was turning over slowly and pumping oil into the cylinders. This trouble is particularly annoying to mechanics in charge of aviation engines, since it occurs at starting when they are working on the engine, and it frequently gives a bad reputation to an otherwise good plug. It is rather rare, however, that the trouble arises in an engine after it has once been started. The trouble may sometimes be identified by the firing of the magneto through



These sectional views of spark plugs are not a part of Dr. Silsbee's report

its safety gap, thus indicating that the voltage required to pass a spark at the plug is greater than that required to break down the safety gap. On removing the plugs from the engine when failure has occurred from this cause they will be found wet with fairly clean oil.

The remedies for this trouble are found in modifying the design of the electrodes. A number of shapes have been used which serve to drain the oil away from the spark gap by capillary force. Experience with various French plugs has indicated that this trouble occurs most frequently in plugs in which one electrode consists of the wall of the spark plug shell as in the Ponsot, Joli, and Rudex plugs.

The trouble is, of course, reduced by avoiding excessive amounts of lubricating oil in the cylinders and by occasionally opening the throttle of the engine while making long glides and thus burning out the accumulated oil before the amount has become excessive. This procedure is common practice. Certain types of high frequency ignition systems have been devised which are capable of giving a much greater voltage than the ordinary systems, and with these the trouble from oil fouling would probably be much reduced. None of these systems is at present in common use so that no field experience is available.

Cracking of Insulator.—Any crack in the body of the insulating material may permit the passage of the spark from the central electrode to the shell in such a location that it does not cause ignition of the explosive gas mixture. The thickness of the insulating wall in many plugs is so great that a spark will not pass directly through a clean crack in the insulator and the engine may run for some time even when the plug is badly cracked. In time, however, the cracks in the interior of the plug become filled with carbon from the flame and will finally conduct sufficient current to prevent sparking at the electrodes. Of course, any broken pieces of porcelain which may be cracked from the insulator are very detrimental to the engine.

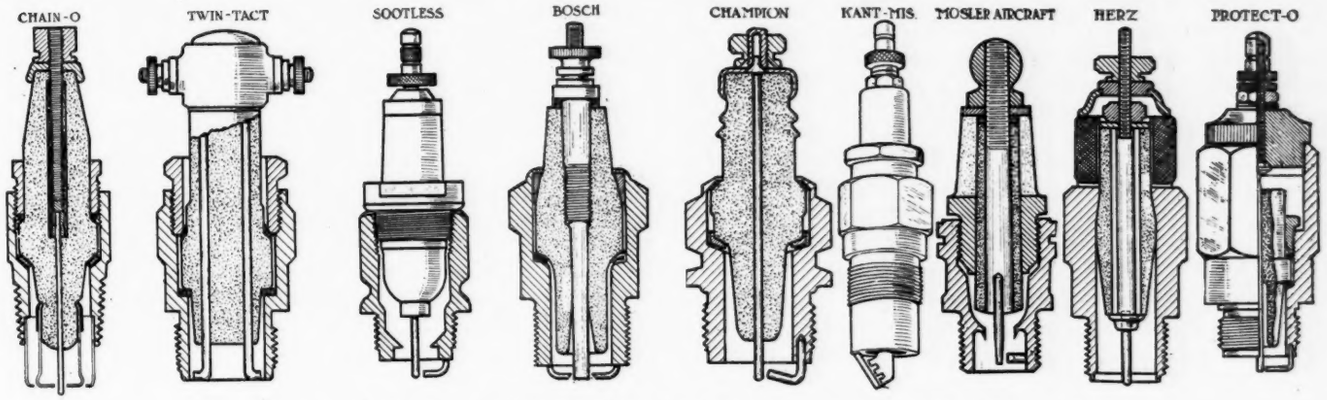
The factors which may cause cracking are several. The mean temperature gradient from the hot inner end of the insulator to the relatively cold shell causes the hotter portions of the insulator to expand to a greater extent than the cooler, and sets up stresses in the insulator itself which may cause cracking. Such cracks are particularly likely to originate where there is a sudden change in diameter of the insulator, as at the shoulder. Also, if the metal parts are so placed that their greater expansion tends to produce pressure on the relatively less expansible insulator, cracks may occur as a result. It is probable that in some cases actual drops of relatively cool lubricating oil may strike the hot parts of the insulator and by suddenly chilling them cause cracks. There seems to be good evidence that in some engines the mechanical vibration of the engine as a whole is sufficiently rapid and intense to break the porcelain from purely mechanical causes. Such breakage often occurs in the outer part of the porcelain at the plane of the bushing or crimping. An impact testing machine has been constructed at the Bureau of Standards in which the spark plug under test is screwed firmly into the side of a steel block which is arranged to strike repeatedly against a steel anvil. The velocity of the block and plug at the instant of impact is about 200 cm. per second and the blows occur at the rate of 300 per minute. Certain types of plugs which gave trouble from cracking in service, also cracked when tested in this impact machine, the location and character of the crack, though different for the different types of plug, being the same in both the engine and laboratory tests for a given type. Since no heat was applied in the laboratory tests, it seems probable that the mechanical shock was the main cause of cracking in these cases.

There is also a considerable breakage of plugs due to accidentally striking them with a wrench or other tool when inserting them in the engine.

Mica Plugs Not Subject to Cracking.—In the Bureau of Standards' laboratory approximately 40 per cent of the failures which occurred with porcelain plugs were due to cracking of the insulator. The reports from France indicate that considerable trouble has been experienced from this cause, and that as a result mica plugs are much more popular, and only a relatively small proportion of porcelain plugs are now used in that country. A plug which has failed in this manner usually shows continuous misfirings, although in the case of a small crack the missing may be irregular. On removal of the spark plug, the crack may often be located by the grating sound heard when the plug is strained by the fingers, in cases where no crack is visible at the surface.

Mica plugs are, of course, practically free from this source of trouble and the most obvious remedy with porcelain plugs is to use a material which shall combine at the same time a high mechanical strength, a low modulus of elasticity, a low coefficient of thermal expansion, and a high thermal conductivity. During the past two years very considerable progress has been made by a number of porcelain manufacturers in developing insulating materials which are superior in these respects to those formerly used.

Certain plug designers have endeavored to avoid trouble from this source by making their insulator in two or more pieces as is done in the Pognon and Duffy spark



These sectional views of spark plugs are not a part of Dr. Silsbee's report

plugs. In these plugs the innermost porcelain attains a relatively high temperature and expands correspondingly while the outer pieces are cooler and expand only slightly. The passage of a spark between the central electrode and the shell through the joint between the porcelain sections is prevented by a wrapping of mica around the interior of the shell and around the electrode, respectively. It is, however, very difficult to make plugs of this type gas tight.

In plugs in which the central electrode is cemented in the porcelain throughout the greater part of its length, it is essential that the diameter of the electrode be kept small in order that the total amount of its thermal expansion may be taken care of by a yielding of the cement without setting up excessive strain in the inclosing porcelain. Closed-end plugs serve to reduce the trouble from the spraying of drops of cold oil upon the hot insulator, and the resulting splitting off of bits of porcelain. They also tend to prevent any broken pieces of porcelain from getting into the engine cylinder.

Heavy Gasket a Safeguard.—Breaking of the insulator by the mechanical vibration of the engine seems to be materially reduced if the insulator is cushioned by a considerable thickness of packing material, such as asbestos, placed between the shoulder of the insulator and the bushing. The plugs in which the edge of the shell is crimped over the shoulder of the insulator, commonly called the one-piece type, have given considerable trouble from cracking of the porcelain at the edge of the shell. This effect seems to be due in part to the rigid connection between the shell and the porcelain, which transmits the mechanical shock of the engine without any cushioning, and in part to stresses set up in the porcelain by the shrinking of the metallic shell after it has been heated during the process of crimping. These troubles can be materially reduced by proper design of the tool used in making the joint. Variations in the proportions of the plug make a decided difference in its resistance to breaking from mechanical shocks. A long and slender porcelain is apt to give decidedly more trouble from this cause.

Preignition.—This trouble, when chargeable to the spark plugs, is the result of too high temperatures occurring at some part of the plug, either the tip of the insulator or end of the electrode, or other small projection, resulting in ignition of the charge in the cylinder before the end of the compression stroke. Preignition may occur from several causes not connected with the spark plugs, as for instance, from overheated portions of the combustion chamber, such as hot exhaust valves, from hot points or flakes of carbon or other material lodged in the cylinder and heated by compression of the charge adiabatically to a temperature where ignition occurs spontaneously. There is probably a definite relation between the maximum compression pressure and the tendency to preignite from hot points, since the higher the compression the more readily is the charge ignited.

The importance of this cause of trouble seems to have been somewhat overestimated. It has been observed only in rare cases in the engines tested at the Bureau of Standards, and reports from France show it to be of minor importance. In cases where the spark plugs are leaky and are consequently unduly heated by the passage of gas through them, temperatures which will cause preignition, however, may often be attained. The danger of preignition, moreover, limits the extent to which the design of spark plugs can be modified in the direction of maintaining high temperatures, and prevents the use of otherwise desirable designs which would operate at such high temperatures as to insure the burning off of the deposits of carbon.

Definite identification of this source of trouble is quite difficult without the use of an engine indicator, but mechanics familiar with the running of the engine can often judge by the noise and vibration when preignition is occurring. In some cases ignition from overheated plugs may occur before the inlet valve has closed. This results in the familiar "popping back" in the carbureter and may constitute a serious fire hazard on a plane. A careful distinction should be made between true preignition, and what may be called "afterfiring." This latter phenomenon consists in the continued operation of the engine after the ignition system has been cut off, as a result of the ignition of the charge from heated surfaces within the cylinder. Ignition from such surfaces is slow and has the effect of a greatly retarded spark. The combustion in such cases is relatively late, does not yield much power, and can maintain only a very slow engine speed. The pressures obtained by this effect probably occur so late in the stroke as not to interfere with the normal operation of the engine when the electric ignition is also functioning.

Remedies for Preignition.—Remedies for preignition, as far as the spark plugs are concerned, are obviously to keep the insulator as cool as possible by making it short and compact. Long central electrodes should be avoided, and also constructions which tend to permit the formation of flakes of mica, which, owing to their low heat conductivity, will maintain their high temperature throughout the intake stroke. The use of a copper rod for the central electrode should be effective in this respect, but introduces difficulties from expansion and oxidation. Other extreme designs intended to eliminate preignition troubles have used a hollow central electrode containing a small quantity of mercury which, being

vaporized at the inner end and condensing at the outer, greatly increases the effective heat conductivity of the electrode. Other designs of plugs have used check valves which allow cool air from without to be sucked past the insulator during the intake stroke, but which prevent leakage of gas outward during the remainder of the cycle. This latter design, however, has not proved practical. There seems to be good evidence that the exhaust valves operate at nearly as high temperatures as the spark plugs, and they are probably equally effective in producing preignition where this trouble exists.

Conduction Through Insulator.—It has frequently been stated that cases of spark-plug failures in very hot engines may be attributed to the fact that at high temperatures the insulating materials used in the plug become to some extent conductors of electricity and reduce the insulation resistance below the critical value of about 100,000 ohms. As a result of an exhaustive study of the subject, it appears that only in extremely hot engines and in cases where the ignition system is unusually feeble is failure of ignition likely to occur from this cause. The early reports received concerning this cause of failure have not been confirmed by later information from France, and it appears that the importance of this cause of failure has been exaggerated. The remedies for this trouble are, of course, the use of material of high resistivity, such as fused quartz, mica, or some of the porcelains recently developed by the bureau and by certain manufacturers. An alternative remedy is to use an auxiliary spark gap in series with the spark plug, as in cases of carbon foulings.

Electrical Puncture of the Insulator.—The possibility of a direct puncture of the material by the igniting voltage is of much interest, though difficult to study quantitatively. In considering this matter the two very different methods of possible electrical failure of an insulating material must be carefully distinguished, as much confusion has arisen from failure to do this. The first of these is usually called "dielectric breakdown." This is exemplified by the behavior of a sample of porcelain tested cold by applying a known voltage and gradually raising this until at about 8,000 volts per millimeter a spark passes through the porcelain. The voltage thus observed is called the breakdown voltage of the material and has a fairly definite value. Under these conditions the leakage current through the sample, even just before the breakdown occurs, is very small, and the sample is therefore not heated and changed in its properties appreciably by the application of the test voltage.

The second type of failure may be called "conductive breakdown," and is exemplified by the behavior of a porcelain sample tested when hot, say, at 500 degrees C. At this temperature the resistance of a centimeter cube of ordinary porcelain is about 100,000 ohms, and if a voltage of only 500 volts per millimeter (i. e., only one-twentieth of that in the preceding case) is applied the current flowing will be 50 milliamperes, and the power dissipated in the sample will be 250 watts. This would, of course, raise the temperature of the sample very rapidly (at the rate of about 100 degrees C. per second), and the resistance would consequently drop still lower and the material would be fused and destroyed in a very short time. It can be shown that although there is a fairly definite value of voltage and temperature at which samples tested under identical conditions fail in this manner, yet these values depend very greatly on the conditions of the experiment, such as the rate of application of the voltage, the ease with which the samples can lose heat to the surroundings, etc., and that it is impossible to assign any definite breakdown voltage to the material when tested in this manner. It is evident that the two types of failure depend on entirely different properties of the material, and so far as is known there is no connection between the two.

Owing to the rather remote possibility of this type of failure and the experimental difficulty of producing in the laboratory dielectric breakdown without conductive breakdown, no measurements have been made of the dielectric breakdown strength of insulators when hot.

Minor Troubles.—In addition to the principal causes of failure discussed above, trouble is occasionally experienced from warping of the electrodes. This either short circuits the gap or increases it to such an extent that the breakdown voltage required is more than the ignition system can furnish. This trouble can be remedied by supporting the central electrode to within a short distance of the spark gap, but many plugs are on the market in which a great length of unsupported wire is used.

With prolonged use the surfaces of the electrodes gradually corrode away as a result of oxidation between the crystal grains.

With the alloy usually used (Ni 97 per cent, Mn 3 per cent) this corrosion is very slow and the life of the plug is almost invariably limited by one of the other types of failure. It is stated, however, that slight impurities in the electrode wire greatly accelerate the rate of corrosion. If the construction of the plug is such that the material is subjected to a mechanical tension, the intercrystalline cracks are pulled apart and the deterioration is much more rapid. Tungsten has been suggested as an electrode material and would appear to be well suited because of its high melting point, low coefficient of expansion, and high heat conductivity. Preliminary tests at this bureau in which sparking was produced for a long period between tungsten electrodes in an atmosphere of CO, showed very little corrosion. The extreme hardness and rigidity of the metal, however, makes it difficult to handle in manufacture, and its adoption for commercial use is probably not warranted.

In some cases a chemical corrosion of the electrode which ultimately causes the tip to drop off has been produced by a reaction between the material of the cement and the metal of the electrode at the high temperatures of operation. This matter can be remedied by the use of suitable cements.

There seems to be some evidence that with very rich mixtures a deposit of carbon may be built out on the electrode surfaces themselves to such an extent as to short circuit the gap. The heat energy of the spark itself is, however, usually sufficient to burn away such deposits.

Electrical brush discharge over the hot surface of the insulator is occasionally suggested as an explanation of spark-plug trouble. A study of this effect made in the laboratory, while not entirely conclusive, seems to indicate that it is not an important factor. Experiments at atmospheric pressure and high temperature show that a brush discharge which forms a delicate purple glow over the surface of the insulator is produced when sufficiently high voltage from an ignition system is applied to a spark-plug insulator. The voltage required, however, is more than enough to cause a spark to jump from the central electrode to the shell. Experiments at higher pressures and at temperatures up to 760 degrees C. showed no trace of brush discharge in a plug having a gap width of 2.2 mm., although the pressure was raised to such a value as to require a sparking voltage of about 14,000 volts. The data at hand indicate that the increase in pressure in the engine cylinder is as effective in pre-

venting the brush as it is the spark discharge. Consequently the former might develop only in case there were a layer of gas near the insulator which was decidedly hotter and less dense than the gas in the spark gap. Such a condition is very improbable in view of the turbulent motion of the cylinder contents.

Notes on Plug Design.—It will be noted from the preceding discussion that the remedy suggested for one cause of failure is very often directly opposite to that suggested for another, and the proper design of a spark plug becomes a matter of balancing the conflicting requirements. The conditions in various types of engines vary quite widely, some having much higher operating temperatures than others and some having much greater amount of lubricating oil present in the combustion space than others. The type of spark plug which is suitable for one class of engine may fail to operate another.

The following general statements, however, seem to be justified by the information available. As to the material of the insulator, mica has the great advantage that it will not crack as a result of temperature gradient or other reason. Porcelain, however, is definitely superior in resisting the formation of deposits of carbon and is also much less expensive to manufacture. It may be said in general that the mica plug has to be of very good grade and workmanship to compete with a good porcelain plug, but is definitely superior to a plug with a poor grade of porcelain.

Assuming equally good workmanship, the method of making the joint between insulator and shell seems to have little effect upon the gas tightness of a plug except in certain designs where the insulator is molded into the shell, in which case absolute tightness can be secured. The process of crimping the shell around the shoulder of the porcelain is very liable to set up strains and cause cracking of the insulator, but has the advantage of cheapness and rapidity of construction.

The shape and arrangement of the electrodes seem to have but little effect upon the operation of the plug, with the notable exception that plugs in which the side wall of the shell forms one electrode are definitely more liable to foul with oil and make starting difficult. The breakdown voltage of the spark gap depends to some extent upon the shape of the electrode tips, but such variation in breakdown voltage is comparatively slight and can be compensated for by a very slight difference in the length of the spark gap. The use of rather fine wires as electrodes tends to ease in starting, as any oil film is readily burnt off, but is liable to cause preignition in hot engines. The use of a central electrode consisting of a disk or similar shape seems to have little advantage as far as the spark gap is concerned, for while it slightly reduces the likelihood that all possible sparking points may be fouled with oil simultaneously, the danger of short circuiting at least one of the many possible sparking points with carbon is correspondingly increased. The merits which this type of electrode may have lie in the protection which it may afford to the insulating material back of it.

Improvements to be expected in the construction of spark plugs seem to be along the lines of better porcelain bodies which are less likely to crack and the construction of a molded or fused insulator which will insure absolute gas tightness. There seems to be also a very considerable field for improvement in ignition systems so that they will be able to fire a spark plug even when it does not maintain the high insulation resistance which is required by the systems now in use. There is a great need of definite and accurate statistical data as to the performance of spark plugs of different types in various engines under service conditions, as it is only on the basis of such data that the real worth of any design can be determined, and it is only by the compilation of much larger amounts of such data than are now at hand that more definite conclusions as to the proper type of design can be based.

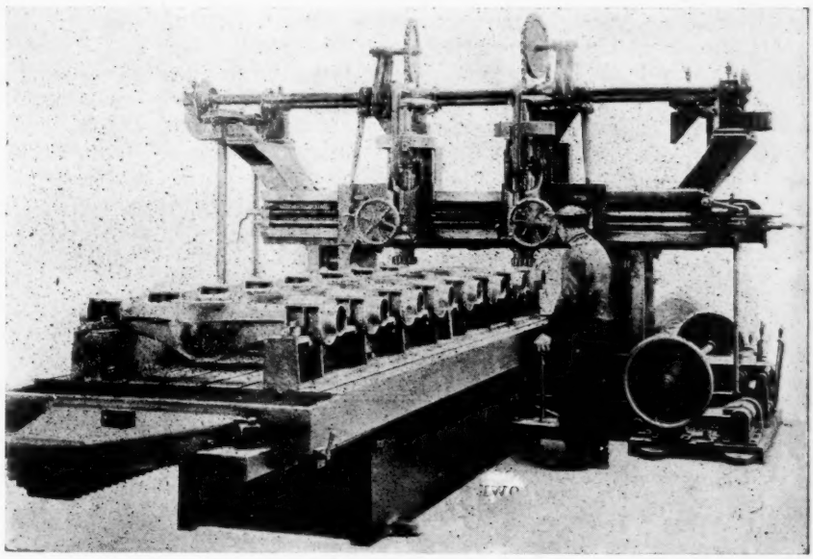
Forcing Press for Bearing Sleeves

THE forcing press shown is useful for a variety of purposes, and particularly for such work as pressing in large bearing sleeves in heavy truck axle housings. The absence of columns permits unrestricted and easy handling by crane of heavy work in and out of the saddle. Quick and accurate centering is provided by a carrige with rack and pinions and horizontal traverse.

The rated capacity of the press is 35 tons. The ram is 6½ in. diameter, with a 27-in. working stroke and a rate of travel of 20 seconds per foot. The return rate is five seconds per foot. There is a clear height of 10 in. from the top of the bed rails to the center line of the ram, and a width between rails of 21¼ in. A maximum clearance of 115 in. is provided between the ram head and the resistance sleeve, and may be diminished to suit conditions. The resistance sleeve permits 10 in. adjustment through stepped grooves of four spacings, and is locked in place with U-shaped keys.

Attractiveness of design has been looked after and combined with strength of construction in this press, which is made by the Metalwood Manufacturing Company. The floor space occupied is 3 ft. 9 in. by 17 ft. 3 in. with the full 115 in. clearance.

A belt drive from a line shaft runing at 200 r.p.m. may be used, or a belt drive from a 5 hp. motor of 1200 r.p.m. The pulley size is 22 in. by 4¾ in.



The Metalwood heavy forcing press handles eight truck axle housings

New British Tool Plant Aids Adoption of American Methods

British car manufacturers have been influenced by American production methods but could not adopt them because of a lack of tools. This article, however, tells how an American manufacturer established a plant in Middlesex in which American production methods were utilized.

By Clyde Jennings

EVIDENCE accumulates of the influence that American production methods are obtaining in English and other European automotive plants. Several articles pointing to this influence have been printed in AUTOMOTIVE INDUSTRIES, but it has not previously been stated that this influence would have been much greater had it not been hampered by the inability of the European manufacturer to obtain the tools necessary for the best use of these production methods. The advance of the American production methods probably will be much greater now, too, that facilities are being placed within quick reach of the European. The present development is the opening in Edgeware, Middlesex, England, of an American staffed and equipped factory for the manufacture of broaching tools.

Before the war American machine tool builders had sold a number of broaching machines in several European countries, chiefly England, France, Belgium and Italy. These machines were used chiefly for slotting and similar standard operations and the tools used were those of stock sizes and equipment. Following the war, when the automotive manufacturers, particularly, were giving much thought to American production methods with a view to competing with American cars in the world sales field, there was a strong demand from abroad for special tools.

With production uppermost in his mind, the foreign manufacturer quickly appreciated the advances in broaching which supplies a hexagon hole with one side round at a rate of 45 pieces an hour; the four spline hole 1⅞ in., with splines ¾ in. by 3/16 in., 2¼ in. long at the rate of 20 pieces an hour; 1-in. square hole, 1½ in. long at 40 pieces an hour and similar advances in broaching, and he came into the class of those who wanted quick and special service. In fact, in looking into the American production methods, he caught the American spirit of service he expected from those who served him. And there was no one in Europe to give this service to him!

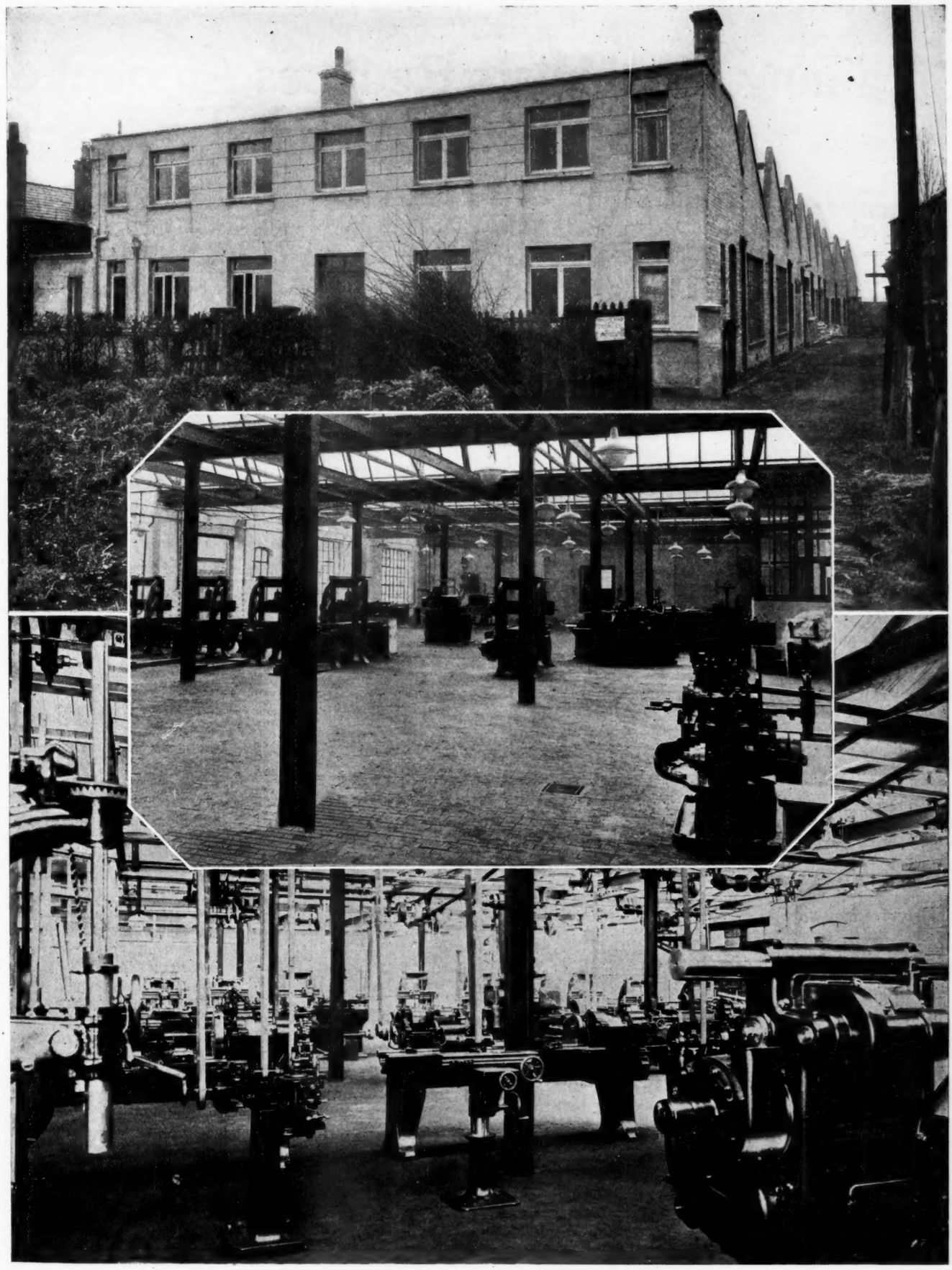
As each new broaching job is first of all an engineering job, distance complicated the desire for a quick service. It took time for an exchange of blue prints and the delay in sending the specifications from the foreign factory to the American tool plant often disturbed the best-laid plans. Even when acceptance and prices were cabled back, there was delay in shipment of the tools, and so weeks, and sometimes months, elapsed between the time when the job was wanted and when it actually was delivered. This, of course, was aggravated by the general disturbance of mails and transportation throughout the world.

There was a time when this delay would not have been a worry to the foreign manufacturer, but this was not immediately after the war. The limitations of the foreign development of production equipment were realized by the manufacturer for the first time and he then learned that production is an engineering and mechanical development, not an idea or a man. The ideas and the man are component parts of production, but the tools supply the material for putting production into practice.

It was in this situation that J. F. Owens of the Lapointe Machine Tool Co. went abroad to see what he could do to give better service to the broaching machines in service in those countries. His survey revealed but one solution—local service. He returned to this country and the Lapointe company quickly made its decision. The necessary machines for the manufacture of broaching tools were brought, a staff of 10 men to operate under Mr. Owens was selected. This staff included an engineer, a production manager and competent and carefully trained foremen for each of the departments. In February this nucleus of a factory started for England, accompanied by John J. Prindeville, president and treasurer of the company, who was to see them settled and put to work.

In due time the equipment was on a Liverpool dock, and the men housed in hotels. The idea had been that some vacated war equipment factory could be rented and the machines set up. But local conditions proved that this would not be satisfactory, but a building in Edgeware, built in 1917 for war work, was found. It was not for rent, but for sale. It was well constructed of the latter saw-tooth architecture and was just as though it was made to order for the factory planned. Mr. Prindeville was offered a 24-hour option on the building, but he declined this and bought it on the spot.

Beginning that day the installation of the machinery began and the plan for the financial arrangements were taken up. A very little investigation of the situation convinced Prindeville that the idea of an American factory branch was out of the question. The reasons for this would be a long story, but a conclusive one. Taxes were a strong argument, especially in view of the taxes now placed on foreign money invested in that country. So the British Lapointe was born and today it is a British factory directed by Americans and equipped with American machines, and it is supplying satisfactory tools for the equipment of American machine tools, which, in turn, are assisting the European automotive manufacturers to introduce some of the American production methods into their works.



Top—The factory purchased by the British Lapointe company at Edgeware, England, in mid-February, 1920. Center—An interior view of the factory as it appeared on March 27. Bottom—A section of the factory on May 1, 1920, equipped with American machinery for steady and quick production

Training Machinists Reduces Amount of Spoiled Work

The machinists' training school of a New England plant serves to reduce the amount of spoiled work, to lessen the number of accidents, to reduce labor turnover. It fulfils, as well, its primary purpose of furnishing skilled and properly trained workmen for the factory personnel.

Norman G. Shidle

CONSERVATIVE experts on industrial training have felt for some time that the real value of such instruction has been somewhat obscured by some of the pseudo-experts who plied their trade quite extensively during the war period. For this reason care must be exercised in choosing courses to be described as good examples of the best practice. A wealth of experience, however, is behind the educational developments of the Norton Co. which render them worthy of consideration.

The entire educational program of this concern, like that of the Goodyear Tire & Rubber Co., is too large to be described adequately in a short article. The accompanying diagram (Fig. 1), however, will show in a general way the broad scope of the courses. The particular course of most interest to automotive manufacturers is the course for training operators and apprentices, listed as T3 under the machine division on the chart.

This course trains men to operate the usual shop machines and at present about thirty-five men are under instruction. An operator is trained to run just one machine and is then sent into the shop on piece work. The apprentice, on the other hand, is trained on a number of machines by means of a rather distinctive method. He is taught to operate the following machines during his course of training:

Lathe,
Milling machine,
Drill press,
Shaper,
Grinding machine.

He is also instructed in bench work and is taught the mathematics of the operation while on the job.

The course operates in this way. Suppose the apprentice is to learn drill press operation first. When he has become acquainted with the drill press—six weeks is the time usually needed for all types on both jig and layout work—he is sent into the shop to work piece work. There he remains for at least three months. At the end of that time he returns to the training department and takes up another machine, the lathe, for instance, and again goes through the same process. If he does not make good on piece work in the shop, he must return to the training department again for further training on the drill press.

During the training course the men are paid fixed rates which vary with the economic condition and previous experience. The rates for this period are as follows:

Single man, entirely "green," 38c. an hour.
Single man, slight experience, 40c. an hour.
Married men, entirely "green," 45c. an hour.
Married men, slight experience, 50c. an hour.

To give the man a fair chance when he goes into the shop, he is guaranteed his day-rate during the first two weeks after leaving the training department, provided he makes the proper effort. While in the training department, however, the men are taught the essentials of operating at production speed so that most of the graduates are able to earn more than their day rate within a short time after going on piece work.

The men work a 55-hr. week, both in the shop and in the training course. They receive the regular rate for 50 hr. and time and a half for the other 5 hr.

The basis of the training is similar to that outlined in Bulletin 52 of the Federal Board for Vocational Education, but certain modifications have been effected to adapt that outline to the specific needs of the Norton plant.

Fig. 2 illustrates the course in lathe work. Similar charts for every machine operation have been prepared and are posted throughout the training department. This enables the student to visualize his instruction and to know what he should ask about. A study of this chart will show the thoroughness with which the essential elements of successful lathe operation are presented.

As previously noted, the trade mathematics are taught by the instructor on the job. Blackboards throughout the

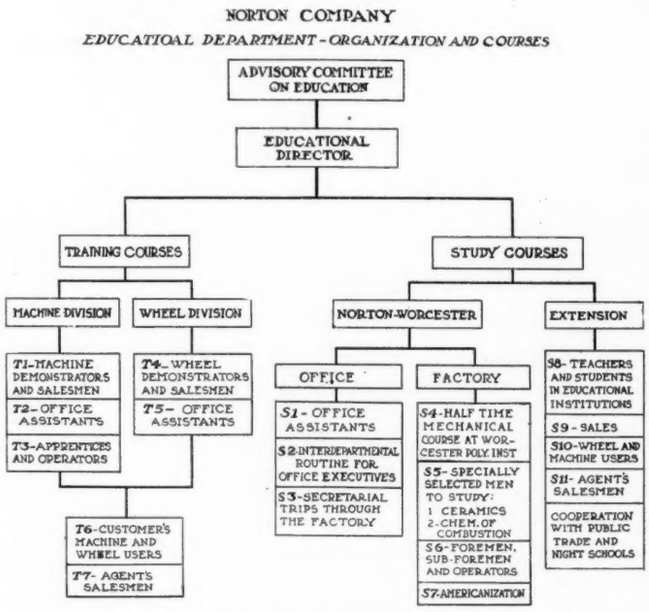


Fig. 1—Chart showing scope of educational work at Norton Company

Training Department

Progress Chart—Lathe Work

	Type Job Specifications	Objective	Auxiliary Information	Trade Mathematics	Trade Drawing	Trade Science
1	Rough straight turning on medium-size stock between centers. Stock in machine or already centered. One diameter only to 1/16 in. oversize. Automatic longitudinal feed. Machine set for speed and oiled by instructor. Job done on 14- to 16-in. engine lathe.	Men can take piece of centered stock, put it in machine, pick out right tool, set tool correctly, and turn diameter within 1/16 in. of given dimension.	Recognition of stock and some knowledge of working properties. Trade terms, names of parts of machine and names of tools so far as they relate to this class of work. Safety precautions: care of tools and machine. He understands damage due to use of too long a wrench.	Linear measurement; layout of machinist's rule; use of calipers set by reference to another piece or from rule. Fractions 1/2 to 1/32 in.	Dimensions given verbally or orally.	Need for lubrication of dead center. Expansion of work due to heating. Use of screw to produce great pressure and hold it. Use of screw to move parts of machine and hold them in place. Use of friction to drive parts of machine and use of friction as a locking device.
2	(a) Squaring ends. (b) Turning more than one diameter on piece between centers. (c) Locating and facing shoulders. (d) Use of stops for duplicating dimensions. (e) Job includes centering.	Man can use scale or length gauge; can do any ordinary turning job with any number of dimensions; can adjust lathe roughly for speed, can turn a number of pieces of the same kind.	Additional trade terms for repetition work and squaring. Additional machine construction and parts required for intelligent oiling.	Finding center of circle in addition to preceding: 1. By eye; 2. Centering machine; 3. Center square; 4. Dividers. Approximate setting of machine for cutting speed by cone pulley only.	Dimensions from sketch. Length and diameters.	Friction between surfaces. Elasticity of metals (spring of tools).
3	(a) Long work requiring use of steady or follower rest. Any number of linear dimensions to 1/64 in., diameter 0.001. (b) Use of power cross feed for facing. (c) Making of running fits and press fits on small work.	Man can do any ordinary job of turning on short or long work to a fit, including filing. Can use micrometer and vernier calipers and can make ordinary running and press fits on small work.	Additional trade terms required for additional attachments and adjustments.	Linear measurement, use of micrometer, snap gauges and limit gauges. Reading decimals; decimal equivalents (on micrometer) or computing by binary division; Vernier calipers.	Linear dimensions and diameters from side and end view of sketch or detail drawing.	.....
4	(a) Chucking; (b) boring; (c) turning; (d) facing, and (e) cutting off in chuck; (f) accurate boring and reaming; (g) grinding tools.	Any average size chucking job, round stock, including chucking out, boring, turning and cutting off. Has all the auxiliary information required for the substitution of the chuck for centers, boring and new tools used.	Additional auxiliary information as to trade terms as to chucking operations, care of tools and machine, names of tools, safety items. Chucks, chuck tools, drills, reamers, boring tools, miscellaneous.	Truing up by trial and error method. Setting piece of circular cross section in chuck so that center of the section coincides with the center of rotation.	Can take dimensions and shapes from an assembly drawing.	Principle of lever as used to magnify motion. Illustrated by ordinary lathe-test indicator.
5	Same class of operation as (a) listed in 4, except on larger and heavier work or on jobs more difficult to chuck. (b) Use of compound rest for simple jobs. (c) Inside facing.	Man is able to do any ordinary run of chucking jobs on work of any ordinary size, except unbalanced work and long work requiring support.	Additional names of tools and operating terms due to counter-boring and inside facing; additional safety precautions due to the size, weight, and irregular shape of the work.	Circular measure to 1 deg. Understands angles, including complementary angles.	New material, sections, invisible lines, angles.	.....
6	(a) More complicated jobs in chuck or between centers. (b) Use of back gears for larger work. (c) Steady rest for longer work. (d) Knurling.	Man can do any ordinary job requiring the use of back gears, and can do jobs where the work requires an additional support.	Additional names of tools and operating terms relating to back gears as used for larger work.	Reading depth gauge.	Man at this point has been taught all that he needs to know about blueprint reading. From this point training will be given in reading any kind of a blueprint readily and accurately as called for by the job being done.	The use of gears to change relative speeds.
7	Taper turning and fitting. (a) Use of the taper attachment. (b) Setting tailstock off center. (c) Further use of compound rest.	Man can turn and fit tapers on any kind of lathe job.	Additional trade and operating terms required for taper work. Morse, B. & S., Jarno, and other standards for tapers, taper pins.	Figure approximate set-over s-1/2 TxL.	Conventional methods of giving taper data on drawings.	.....
8	Screw cutting, U. S. Standard threads on ordinary work.	Man can do any ordinary job of lathe work, including cutting V or U. S. Standard threads.	Additional trade and operating terms required for screw cutting.	To set lathe to cut given number of threads per inch by gear table. Measuring threads. Rule center gauge, screw pitch gauge, thin, pointed calipers. Standard threads for given diameters, V and U. S. Standard threads.	Conventional representation and details concerning V. and U. S. Standard threads. (a) Type of thread (form). (b) Pitch of threads per inch.	.....

Fig. 2—Typical progress chart showing detailed instruction in lathe work

school provide a means of illustrating with figures and calculations. The trade drawing and trade science are taught in classroom work. This phase of the course has not been developed to its fullest extent as yet, having been hindered by lack of adequate class room space.

There is no set time for which a man is kept upon each of the machines. The ability of the individual and the rapidity with which he becomes proficient are the determining factors. A student is usually kept in training on one machine, however, for about six weeks.

The training school comprises about thirty-five machines, all of modern design and in first-class condition. It is felt that a man cannot be properly trained on an old, worn-out machine, and that the best equipment is none too good for this work.

The training department not only acts as a school for shop operators but exercises the function of placing men. Thus, a promising student is given a good opportunity for advancement as it arises, even after he has been graduated from the training school for some time.

The question has often been raised as to whether or not a training department is a financial success from the standpoint of the employer. The Norton company feels very strongly that training men does pay. Some sort of training has been given at this plant for many years and the present course is a development of the best practice as evidenced by many years of experience, investigation and observation.

It is estimated that it costs approximately $138 to train a machinist, but that 50 per cent of that cost is paid by the man himself in the work he produces during his course of training. The remaining 50 per cent, and more besides, accrues to the company in many ways. Chief among these ways are the following:

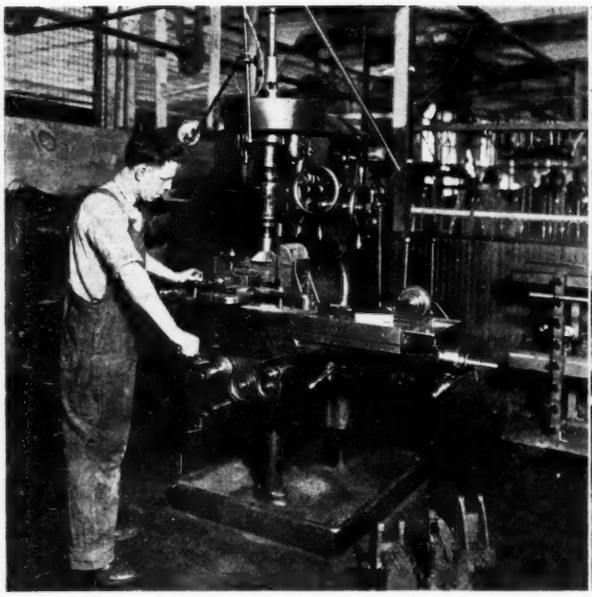


Fig. 3—A milling machine operation in the training school

Fig. 4—Students learning bench work operations

1. Labor turnover is reduced. Fifty per cent of all labor turnover occurs among men who have been with a firm less than six weeks. The men who take the training are tied up to the plant before they ever go into the shop. Only a small percentage of the men leave the plant within a year or two after completing the training.
2. Accidents are lessened. Taught under competent instructors the right way to operate the machines and to avoid accidents, these men save money for the company by lessening the number of accidents.
3. The amount of spoiled work is cut down. Statistics show that the men graduated from the training department spoil less work than other men supposed to be skilled operators.
4. The morale of the working force is raised. The introduction through the training department serves to give them a good impression of the methods and ideals of the concern.

This latter point is illustrated by an incident which occurred recently in the school. When the employment department hires a man as a skilled machinist, the new employee is sent to the Supervisor of Training for an interview. This executive questions him as to his ability and if there seems to be any doubt as to the man's claim of expertness, the supervisor takes him out into the school and asks him to operate a machine.

Not long ago this was done and the new employee was found to know very little about the operation of the machine on which he claimed to be an expert. Instead of berating the man for his falsehood, the Supervisor of Training said, "You don't know how to run that machine, although you said that you did. We will take you in here, however, teach you how to run it properly and pay you a good living wage while you are learning."

Such treatment has been found highly practical and is considered as of great value in making the employee a loyal "rooter" for the company.

Another incident serves to show the real value of the training department. A certain foreman claimed that the excessive turnover in his department was due to the fact that many of the graduates of the training school were "getting through"; he also claimed that they were spoiling a great deal of work. As a result of this claim an investigation was made of the figures for one month. The month was picked entirely at random, so that the statistics, while not exact for a long period, may be regarded as typical. The investigation showed that of 21 men in this department, not training school men, who had been hired on or before Nov. 1, only three were still working there on Feb. 21; that is, there had been a turnover of 700 per cent among this group in only four months. The training department graduates, however, who were working in this department indicated a very low turnover, lower, in fact, than the average plant turnover.

The figures regarding spoiled work showed that the group of 21 non-training school men who comprised 23 per cent of the total working force in that department had spoiled 26 per cent of the spoiled work, while the training school group recently graduated, who comprised 15 per cent of the working force, had spoiled only 11 per cent of the entire amount of rejected work. These figures are interesting rather for the general indications which they present than for the actual values.

The training department serves as well as to enable some estimate of a man's latent ability to be made. The Supervisor of Training watches carefully the work of these young machinists under his charge as regards not only mechanical ability, but their attitude toward their work, their general initiative, reliability, etc. He is then able to recommend certain men as prospective foremen or as members of the sales force. In this way much potential ability is discovered and developed as rapidly as possible, when otherwise the company might be losing money by having a good man in a poor position and a poor man in a good position.

The machinist trained in this department is certain to learn to run the machines properly; that is, in the way which is most effective for production and for conservation of the machine. The young fellow who learns from the foreman or an older machinist is likely to have his education neglected concerning the latter point in particular. The man in the shop is likely to be interested in production rather than in economical production, since he is working piece-work and is not paying for the machine. When the young man learns his trade from this source, he may never hear of those things which wear out a machine rapidly, and may go on for years losing money for his employer without having the slightest idea that he is doing so.

It is firmly believed, however, that the company saves much, both in money and morale, by training men thoroughly before sending them out on the job. This is true, not only of the machinist training course, but also of the courses in every other line of industrial activity. The conviction of this particular company on the subject is best evidenced by the fact that the educational department is in a state of further expansion and development.

Publicity and Foreign Trading for the Automotive Industry

Publicity is needed in the export markets for trucks, tractors, airplanes, equipment and lighting plants manufactured in the United States. The story of the American automobile must be told and retold, conditions being such that carefully planned and intelligent sales policies are imperative.

THE American automobile stands to-day in need of publicity in the foreign countries that make up the export markets of the world. Necessary for the passenger car—which is the forerunner and the pioneer that blazes the trails for the manufacturers of other automotive equipment—such publicity is even more imperative to-day for the American made motor truck, motorcycle, tractor, airplane and home lighting set.

That statement follows the reading of numerous foreign publications devoted to the automotive and allied industries. Filled with advertisements of American passenger cars, these advertisements apparently being inserted by the local dealers and garages handling that particular equipment, there is lack of both advertisements and educational matter concerning other automotive equipment. Trucks receive slight attention; tractors almost none at all. Here and there may be found some indications that American factories are turning out motorcycles and farm lighting plants, but the reader must search diligently to ascertain those facts. Here and there may be found an occasional American accessory note, particularly in regard to tires, but it is surprising how frequently such notices are wedged below similar announcements concerning British and Continental equipment.

Publicity in the foreign field is a definite work in itself, differing largely from similar work in the home field. It is something that cannot be handled without intelligent planning and careful attention, but its possibilities are tremendous when it is considered that there are published, outside of the United States and in practically each of the countries making up our export outlets, an approximate 100 publications devoted to the automobile and its kindred subjects. A recent count made at New York showed 84 of these magazines and papers, the number probably falling several short of the actual total. Among them are weeklies and monthlies, circulating not only among the trade but to owners and drivers as well. The number includes, of course, the British, French, Italian and other European automotive business publications, but the greater part is published in non-manufacturing countries, such as South Africa, Argentina or China. Although somewhat circumscribed in circulation—as, for instance, those of the automobile clubs of the larger cities—they are nevertheless of high importance in their particular territories and should be of aid in educating the world to the full use and value of automotive equipment.

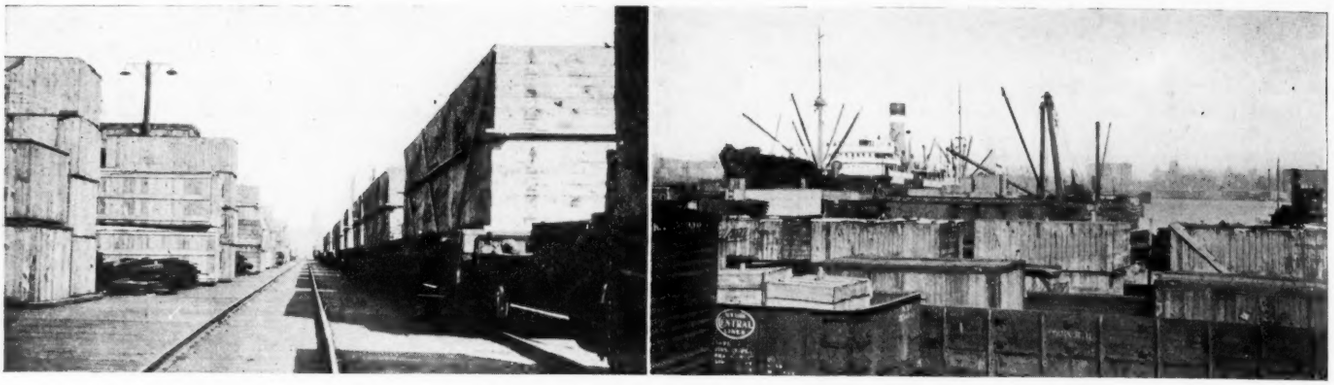
As a matter of fact, that is a part of the big problem confronting the American automotive exporter to-day, a problem largely overlooked because of the heavy foreign demands of the present time. It is not easy for the manufacturer, faced as he is with production, labor, parts, transportation and credit difficulties and with orders exceeding his possibilities of delivery, to think seriously of the necessities of educating the inhabitants of some far distant country into the more widespread use of automotive equipment. But conditions in the foreign field give evidences of being such that campaigns of publicity, of education and of sales are not only necessary but imperative.

The post-armistice demands of the world's buyers already are beginning to slacken. The circle of the credit curtailment and currency deflation, with the concurrent slackening of purchasing, has spread from the United States and, judging from newspapers and letters, similar movements are under way in England and France. Paralleling the action of one of the larger New York department stores in announcing a cash discount on all its sales just before the effects of the American movement began to bring themselves to general attention, a London store of similar size and ideas has announced reductions of a like nature. That is taken as one evidence of the wind's direction; another is the oft-repeated statements of a London correspondent that a let-up in demand would reveal itself shortly. These are evidences that should have their reflex in general policies of sales and operations.

Japan already has gone through a similar financial crisis, in fact preceding the United States to some extent.

A DISTINCT trend of thought, ideas and business actions, differing perhaps in great measure from those necessary for successful trading at home, for the promotion of export selling has been called the "foreign trade frame of mind" by Charles W. Whittemore, president of the Chamber of Commerce of the United States in the Argentine. Just before returning to Buenos Aires from New York, Mr. Whittemore declared that he thought this frame of mind was missing in the United States and he advised that the foreign markets should be intensely cultivated at once.

The foreign trade frame of mind should be directed upon automotive exporting. Sales methods, credits, publicity, transportation, foreign representation—all of these and more are trade problems confronting the automotive exporter today.



These two photographs of crated automobiles destined for export shipments were recently taken at one of the New Jersey docks on the North River opposite New York City

Other countries may expect like periods, the difficulties of the readjustments depending upon the force with which the pendulum swung upward. In any event, slackening of purchase would throw into the markets the troubles of sales resistance, wiping out the days in which the market was that of seller and substituting pre-war competition.

In addition, the European makers are on the verge of production in quantities in excess of their outputs before the war. That point is made clear by W. F. Bradley, the European correspondent at Paris of AUTOMOTIVE INDUSTRIES. Mr. Bradley, who has just returned to his home from the United States, sees a larger production in Great Britain, France and Italy than has been the recent prediction in the United States. When this comes about, if it does, the European will enter into the strongest possible competition with the American and, making his appeal on the basis of quality, he will make every endeavor to regain all or some of his lost export trade. That much seems certain.

It scarcely seems necessary to say that the American manufacturer must consider such possibilities and, taking the situation in the broadest view, he must go out and meet it. One way is by publicity and education—publicity for American cars, but principally for trucks, tractors, airplanes, automotive equipment, motorcycles and farm lights as they exist to-day and as it should be sold.

The American car has made its successful entry into the foreign field. It has gained a tremendous hold upon its markets. But the truck is finding its way only slowly, its field not yet fully developed. The tractor is advancing even more haltingly and, although official figures are not available, it is doubtful if its foreign sales have attained any startling volume. The American airplane, uncomfortable though the realization may be, has scarcely made its mark in the other countries of the world and automotive equipment, even including tires, certainly is not being sold in a volume approaching that of cars.

The passenger car must be kept up to its present totals, the indication now being that the year's exports will go well above 100,000, by far the heaviest of any similar twelve months' period, and the sales of other automotive equipment must continue to grow. Publicity is one means of aiding in this accomplishment, as an adjunct to the sales and merchandising efforts. But how and in what manner?

In the first place, some parts of the world have not yet been "sold" on the automobile, and particularly on the lower-priced quantity produced American made car. Such countries are likened to Europe before the war. Their inhabitants consider the automobile as a luxury, to be utilized only for pleasure by a small part of the population. This, of course, is not true of those territories and dominions, such as the British possessions, that took part in the World War, and in which their young men became acquainted with the automobile through its army use. That may explain, perhaps, one reason why the British-speaking territories of the world have been the heaviest foreign purchasers of American automotive equipment. Such countries have learned to believe in the automobile and its use. Publicity there would take somewhat the same methods and attain much the same results as in the United States, but it must be remembered that these territories yet have a great deal of the European idea, believing to a greater or less extent in the purchase of the continental types of cars.

The American car, with its standardization to make easier the work of service and repair, its sturdy, low compression engine and long life, its higher clearance so that it may travel over rough country roads and its general utility, presents many arguments that may be told and retold. Even in the United States, with its dense motor population, that story is still new and its telling is yet the feature of some of the automotive advertising.

That is one phase. Another is the more elemental phase, if that is a good term to use in connection with a kind of publicity that, after all, is only another variation of the same story. This is for the countries that do not believe so strongly in the automobile. This story must be told in various languages—English, French, Spanish, Italian, Portuguese, to mention the most obvious. Ford is telling the story of his cars, trucks and tractors in ten languages, but the number of other manufacturers who are using anything except English is surprisingly small.

The story of the American made higher-priced car must be told. It is said there are many places on the globe in which the belief still persists that the United States makers turn out nothing but the cheaper cars and that there is nothing to equal or surpass in finish, appointments and equipment the best automobiles of Europe. Here at home, where the evidences of the success with which fine cars are built in this country, one is apt to forget that the entire world does not know of this fact.

The automobile, it seems, is in many parts of the world just where it was in America several years ago. Here, the farmer finds it a necessity for use in the country; elsewhere, the car is yet confined to the city dweller. The truck is a great utility, the use of which knows almost no bounds. In other parts of the world, the truck is more or less of a curiosity. The tractor, in the United States, is becoming a familiar piece of farm equipment, and we have gotten over the point of argument as to whether or not it will plow or pull at the belt and the sales resistance is the model itself, not the idea. But other countries have not grown up to it as yet.

The American dealer believes in the annual and semi-annual automobile show. So does Europe, for the larger cities. But what about South America? How many shows

are held there? South Africa has recently held a big show and jammed the grounds. But what about, say, Shanghai, Bahia, and other foreign centers of potential demand? How many and of what value have been the shows in those places?

The reliability tour was a big aid in "selling" the American people upon the dependability, the sturdiness and the possibilities of the motor car. What of this character has been done in, for instance, Uruguay, South Africa, or New Zealand? This question is asked especially in view of the wide publicity given in South Africa to an American car which recently completed a trip of some 600 miles out of Cape Town. The car and its performance was hailed as a great wonder—and the wonder of it gives rise to the query why more such practical trips have not been taken, not only in South Africa but throughout other parts of the world.

The truck makers are demonstrating their products in this country by carefully worked out tours, the trucks going out to the farm districts and, in some instances, performing actual, worth-while work. Is America the only place in which such methods can succeed?

The time was in the United States when tractor demonstrations consisted of actual work in the fields—and it is debatable whether or not such methods should be continued. But elsewhere there appears to have been few such exhibitions. One was recently held in India, with American machines in competition with those of England and Italy. The Americans, of course, made a high record and the sales result undoubtedly will be worth while. Other demonstrations, if properly handled, would be just as successful.

These are mere suggestions, intended more to stimulate thought upon the subject than actually to point out a policy. The difficulty to be encountered is that these publicity efforts may be made upon the common lines of "bunk" that have characterized so much of the advertising efforts in this country. In the foreign field, the elimination of such copy and of such useless methods is of greater importance even than at home. Here, such copy means little more than a two-cent stamp. In the foreign field, great distances are involved. The South African or the Australian would scarcely receive with any appreciation a letter from the United States in which he is told merely that the "XYZ car is the greatest, the finest, the most wonderful and most truly marvelous of the world, according to (insert name of local dealer)." He would expect something better and it would insult his intelligence to send him something of no greater import. Shanghai, Tokio, Bloemfontein, Wellington and Montevideo know a great deal about automobiles, and present use of the automobile and future potentialities entitle them to higher consideration.

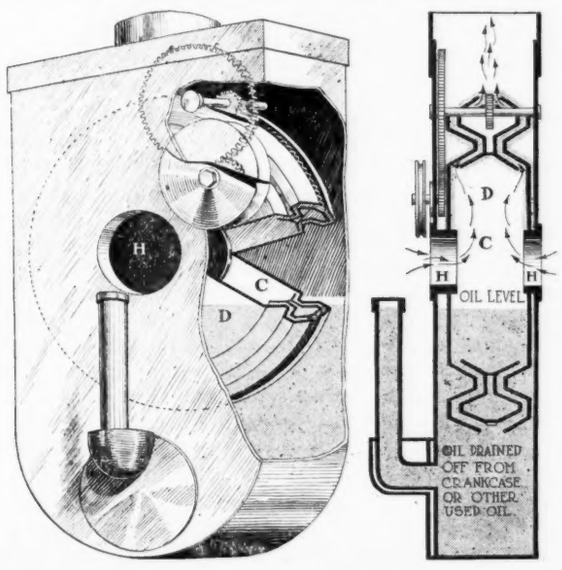
It is repeated that the preparation and planning of such publicity is not the easiest task in the world. It cannot be done with a "lick and a promise." Care must be exercised in preparation of the plan and of the copy itself. Factories should take the standpoint of co-operating more closely with their dealers in the far-off countries of the world. Distant from them by long stretches and many days of travel and, generally, dealing with them through an export house, the problem is a difficult one.

But it has its rewards. The market is slowly changing into one in which the buyer will prevail, giving him the opportunity of picking and choosing. Foreign merchandising then will take on a different aspect and the forehanded company will be the one that will garner the rewards.

Air Cleaning Without Loss of Power

CLEANING the air for internal combustion engines without materially reducing the engine power is a problem that has received considerable study, and a number of devices for the purpose have resulted. One of the more recent of these is shown in connection with this description. In this invention, known as the Martian air cleaner, the dust is deposited on the walls of a winding passage kept wet with oil.

The disk assembly D revolves at about 10 r.p.m. in a tank containing oil which has been drained from the crankcase or other parts of the machine. As shown, the air is drawn through the hollow hubs H into the chamber C, and then through the channels of the disk assembly to the carbureter. The upper portion of the disk intercepts the air, and, as the revolution continues, the dust is washed off and settles in the oil bath, from which it is removed as required.



The Martian air cleaner deposits dust on oiled walls

Cleaning the device is said to be an easy matter. It consists in turning the level gage half way around and removing a cap, after which the oil drains off, permitting access to the accumulated dust, which can be taken out without difficulty. The reservoir should be cleaned daily. It is claimed that power loss due to the cleaner is greatly reduced, because the air is not required to pass through the oil and the air flow is therefore not strangled.

ANY automotive manufacturer who is going to join in the campaign for good roads, either by aiding the local or general movements through publicity or by making speeches, would do well to provide himself with a copy of "The Highways Green Book," published by the American Automobile Association. This is the first annual edition of a much needed history of one of the greatest economic movements of to-day. There are good roads' speeches in this volume, almost ready made, for any occasion that may arise. The chapters are devoted to history, digest of present laws, road management, automobile registration laws, analysis of Townsend bill, types of highways, financing of highways, lists of highway associations and a wonderful amount of data regarding motor cars and roads. This volume will answer a host of highway questions. The price to non-members is $3.

Is the Motor Truck Being Considered in Road Plans?

A questionnaire sent to road officials throughout the country brought out important facts concerning congestion and the necessities of future highway construction. In making such plans, the increased importance of the motor truck entitles its needs to the fullest consideration.

DISCUSSION at a recent conference of the National Highways Association in New York brought out the fact that highway engineers generally realize the necessity for constructing roads which will meet the needs of constantly increasing truck haulage. The truck has become so large an economic factor in transportation that its effect upon roads is no longer as important as the effect of roads upon it.

Since widespread co-operative effort is necessary, however, to the general improvement and construction of roads to meet the needs of truck transportation, considerable interest attaches to the answers to the questionnaire recently sent out by the New Jersey State Association of County Engineers. The inquiry was sent to the highway departments of every state, and also to the various county engineers of New Jersey.

The points covered by the questionnaire are of vital importance to the future of motor traffic, while the answers provide a rather good indication of the trend of authoritative opinion as well as of present conditions. The first question asked is this:

"Should traffic be classified as heavy and light, or as commercial and pleasure?"

Out of fifty-one replies, thirty favored the heavy and light classification, and thirteen the commercial and pleasure, while others introduced sub-classes. One engineer thinks that there should be two classes, heavy commercial, light commercial and pleasure. Another favors three classes, commercial, pleasure, and horse-drawn. The last-mentioned official evidently sees no pleasure in the horse-drawn vehicle, but the object of the question is to arrive at a proper understanding of heavy and light as applied to traffic, limiting and defining the terms so that no confusion will arise during discussion.

In making the classification referred to, should the maximum or the average traffic be considered?

This question drew thirty replies on each side, with a few modifications for good measure. A New Jersey man thinks that the average maximum through June and September should be considered. A road engineer in Massachusetts would base the classification on the average traffic during seven days in August and seven in October. An average based on weights is the choice of another road man. Still another would consider the maximum traffic on main roads and the average on others. An Arizona man thinks that the maximum traffic should be the basis for classification if the information is for the purpose of determining the width of roads, but that the average would be better for other purposes.

What should be the limitations of traffic under the headings light and heavy?

Twenty-one officials who answered other questions shied at this one and left the space blank. Of this number, some perhaps felt that their experience did not warrant an opinion, while others wished merely to assume that indefinite attitude so dear to the heart of many politicians. Quite a number of the answers, however, are worthy of serious consideration. The term heavy should be applied to all truck traffic, according to one reply, and light to the rest. A Pennsylvanian, who divides traffic into commercial and passenger and uses the maximum as a base, would limit passenger service to 1½ tons and commercial to 13 tons. An Oklahoman would regard 1 ton and under as light traffic, and from 1 to 5 tons heavy. A Minnesota road official would classify according to the number of vehicles, considering 5000 a day as light traffic and above that as heavy. A Nebraskan considers 200 vehicles a day as light traffic and above that heavy.

Heavy and light, with a 13-ton maximum limit, is the preferred classification in Virginia, according to a correspondent in that state. In Massachusetts, 2½ tons is suggested as the dividing line between heavy and light traffic. From Illinois comes the suggestion that the wheel load should be fixed and the amount used in the classification. Ten tons on four wheels is the proposal for maximum load coming from Alabama.

Traffic is on the increase nearly everywhere, with commercial cars gaining rapidly, although records are not complete and in some sections are unreliable. In New Jersey, where detailed records are the rule, a number of roads are reported as having reached the limit of capacity, particularly near the larger cities and especially on holidays. Passaic County, N. J., has roads that are overcrowded, and provision will have to be made for the

Motor Trucks and Roads

Should traffic be classified as heavy and light, or as commercial and pleasure?

In making this classification, should the maximum or the average traffic be considered?

What should be the limitations of traffic under the headings light and heavy?

What will be the situation ten years from now?

If traffic is quadrupled in the next six years, will the roads stand it?

From the truck questionnaire of the New Jersey road engineer.

increasing traffic. Parallel roads for freight traffic seem to be the means for betterment most approved in that section, although little has been done so far in putting the theory into practice. Essex County has one road over which 10,000 vehicles pass each day. Bergen County has roads that are crowded on holidays. In Union County, several roads have a traffic in excess of the limits of safety and convenience.

In Pennsylvania, in Allegheny County, a 16-ft. road is being widened to 24 ft., and rights of way 40 ft. wide are being secured on transverse roads and 50 ft. or 60 ft. on longitudinal or main highways. In King County, Wash., the north and south roads are claimed to be crowded to their capacity of 10,000 vehicles a day. Los Angeles County, Cal., reports crowding at times, with truck traffic on the increase. Wisconsin has an 18-ft. road near Milwaukee said to be in a crowded condition. Missouri and Minnesota report roads over-crowded. South Dakota as a rule has sufficient highway capacity, although some of the gravel roads are hardly able to take care of the traffic. Rhode Island has congested traffic in places, one 18-ft. highway taking care of 7,000 vehicles a day. Massachusetts reports crowded conditions, as many as 5,000 vehicles an hour passing some points. The majority of the large cities throughout the country have certain streets crowded to the limit, with conditions growing worse.

What will be the situation ten years from now?

If the general traffic is to become much greater, undoubtedly more highways will be required. Planning for the future seems to be absolutely essential to the welfare of the country. Estimates have been made on the probable increase of traffic in various states and in the separate counties of some of the states. In Passaic County, N. J., it is estimated that there will be 300 per cent increase in traffic during the next decade. Hunterdon County, in the same state, will have a 100 per cent increase in passenger cars and from 600 to 800 per cent in commercial. Salem County will have a 300 per cent increase in general traffic. Atlantic County will increase its commercial traffic 300 per cent and its pleasure 100 per cent.

Similar estimates come from many other states. King County, Wash., will have a 400 per cent increase in automobile traffic in the next ten years. Jackson County, Mo., will have 100 per cent increase in the next five years. Wichita County, Texas, will increase its trucks 500 per cent, and its passenger cars 100 per cent, in the coming ten years. Dallas County, Texas, will have an increase of 300 per cent in its automobile traffic.

Considering the states as a whole, Idaho, Wisconsin, Georgia and New Jersey will double their traffic in the coming ten years. Texas will have a 200 per cent increase; North Dakota, 200 to 250 per cent; Oklahoma, 60 to 80 per cent; Nebraska, 50 per cent; New Mexico, 500 per cent; South Carolina, 200 per cent; Kentucky, commercial cars 300 per cent, passenger 200 per cent; Rhode Island, 150 per cent; Arizona, 300 per cent. Massachusetts doubles its traffic every three years, commercial cars multiplying more rapidly than the passenger. Alabama has an increase of 10 per cent per year. Illinois, it is thought, will increase its traffic 30 per cent each year for the next three years, and then gradually decrease the rate. South Dakota jumps 20 per cent each year.

Statistics taken in some sections indicate that the traffic has doubled in the past in periods of from two to three years. In other words, supposing that 3 years is the period in which doubling occurs, and calling the present traffic 1 unit, there will be 2 units in 3 years, or 4 units in 6 years. If the traffic is thus quadrupled in 6 years, will the roads stand it? According to replies to this question, there would be congestion in parts of many states, including sections of Wisconsin, Texas, Virginia, Kentucky, Washington, Georgia, Rhode Island, Kansas, Massachusetts, Ohio, Pennsylvania, California, New Jersey, New York and Louisiana. Statistics are incomplete in many states and hence cannot be used as a basis for calculations, but the above figures are thought to be representative.

These estimates represent the opinions of the road officials throughout the country. If an over-crowded condition exists today and the traffic is to double or treble, the road capacity, if also doubled or trebled, will still be over-crowded. Such an outlook necessitates an extensive program of highway construction. Furthermore, the need for action in many instances is claimed to be immediate and urgent.

The Zanzibar Market

ZANZIBAR is a little known island on the east coast of Africa that apparently will afford soon an increased market for automobiles and trucks. The island, is termed, by a writer in the London *Times*, the communication center of East Africa. He adds that an extensive road program is under way and that this will permit of a wide use of truck transportation for haulage that now must seek water routes. He states further:

"It is interesting to note that at the time of writing the Zanzibar Government is waiting the advice of experts with a view to the possibility of constructing deep-water berths for ocean-going vessels, and docks. Pemba Island also possesses several good anchorages on the western side. Communication between the islands and between the various parts of the main island have been carried out in the past by dhow, and even to-day a considerable portion of the produce of the interior is brought into the town of Zanzibar by dhow; but now that the excellent scheme of road construction in the main island is completed, it is anticipated that this method will be largely supplanted by road transport. The roads that have been made are mainly suitable for motor traffic, and it may be anticipated that the near future will see motor transport supplanting the camel and bullock carts of an earlier age. In addition to these roads, there is the railway running to Bububu, some seven miles to the north. This line runs through important cocoanut groves and clove plantations."

The principal industries of the island are stated to be cloves and copra, for the former of which some 20,000 acres are under cultivation.

THE Rocky Mountain Petroleum Association has been formed for the purpose of assisting the Bureau of Mines in improving oil well conditions. A sum of $30,000 has been raised for this purpose and one well, which had been flooded with water, was drained out. This well is now giving 700 barrels of oil a day and the profits from it are sufficient to carry on the work for the whole of the territory. Similar work in California has shown excellent results. Companies which brought only 30 per cent of their wells to completion are now getting 80 to 90 per cent.

The FORUM

Advertising Copy

Editor AUTOMOTIVE INDUSTRIES:

A GREAT many times we are confronted by an advertisement in your magazine, as well as other business journals, of a manufacturer who asks in his advertisement to write for catalog and prices, and if you are interested you will naturally write for further information regarding whatever particular line you are interested in.

For instance, you write to a manufacturer in New Britain, Conn., or Providence, R. I., or New York City, or a hundred other places in the East as the case may be. About 75 times out of 100 you get a reply within three or four days asking you to address their branch office in Chicago, or Minneapolis, or Detroit, as the case may be, and to address all communications to them in the future. Then, in three or four days, you get a reply from the branch office referred to stating that the factory has advised them of your inquiry, and they herewith give you their proposition, but in the future, "please address all communications to this office in order to save time."

Now, the point we are driving at is this: Why, under the sun, when an advertiser advertises, doesn't he put in the address of his various branch offices and warehouses? It will save about a week's time in getting a reply, and it would be surprising if you were to find out how big a saving of time it would be for the person dictating letters, for stenographer's time, not to count in the cost of postage and stationery.

There are several of the wide-awake fellows who probably realize what this means, not only to themselves, but to their many prospective customers scattered throughout this broad land, and they finish up their ad, giving the address of their various branch offices. We believe the time is ripe for all the advertisers to indicate in their ads their various branch offices and warehouses. This will apply, of course, to the Middle Western states, and to factories in the extreme East.

There is a tremendous lot of advertising being done, and a tremendous lot of correspondence going on between the Middle Western states and the East, and you can readily appreciate the vast saving in time and money if our views in this matter were carried out, and every advertiser, regardless of where he is located, would be benefited.

We believe that if you were to publish our letter in your journal it would be read by a great many of these people and possibly would bring about a reform in the way they address themselves in their various advertisements. Would like to have your views on this matter, and if you approve of this letter being published, would kindly ask that you have it followed with the footnote to have other publishers please copy in order that other business journals might get this letter, thereby coming under the eyes of a great many firms who advertise along the old method.

Yours very truly,
NORTHERN HARDWARE & SUPPLY CO.
J. Gilbert Taylor, Menominee, Mich.

Whose Crankshaft Is This?

Editor AUTOMOTIVE INDUSTRIES:

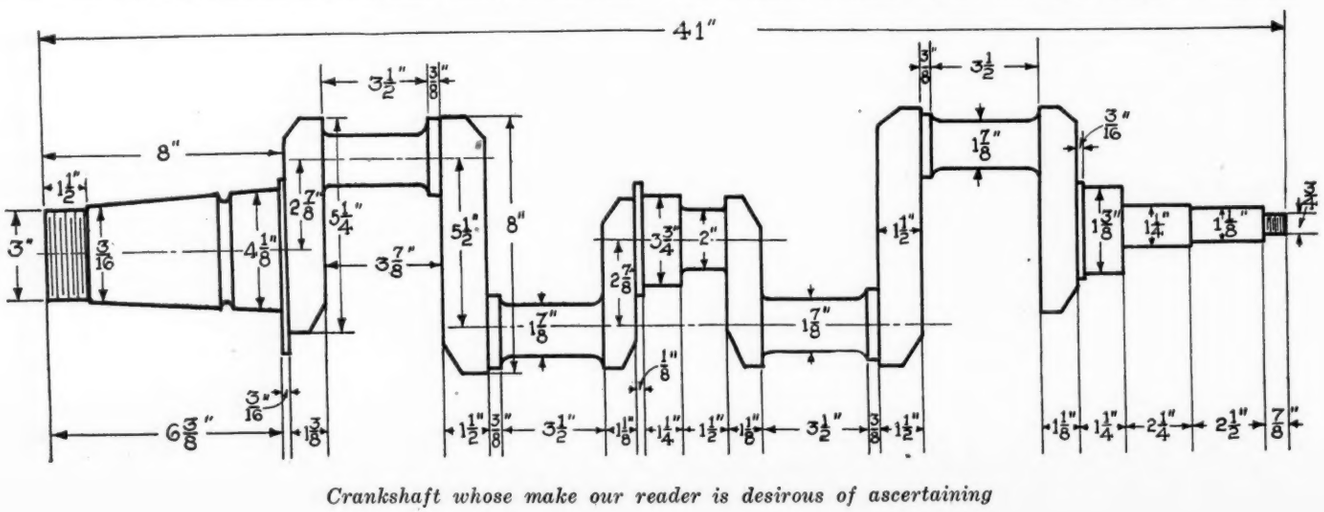
AS a subscriber, I am taking the liberty of seeking from you some information which I think most probably you will be able to give.

Some friends of ours have acquired a considerable quantity of crankshafts finished complete and as per blueprint enclosed. These crankshafts, we understand, were salvaged from a vessel torpedoed between England and France. The condition is as new, as they are packed in cases.

What we should like to know is whether you can acquaint us with the make of the vehicle for which these crankshafts would be suitable. We ourselves are strongly of the opinion that they have been manufactured for an American engine, as we have not been able to locate them as being a type used in this country.

The information required is, of course, with a view to offering these shafts for disposal. T. SAWYER & Co.
J. Sawyer, 94 Market St., Manchester, Eng.

The drawing of the crankshaft, which latter is evidently of the ball type, is reproduced herewith. If any reader recognizes the design we should feel obliged if he would let us know to what engine the shaft belongs.—EDITOR.



Crankshaft whose make our reader is desirous of ascertaining

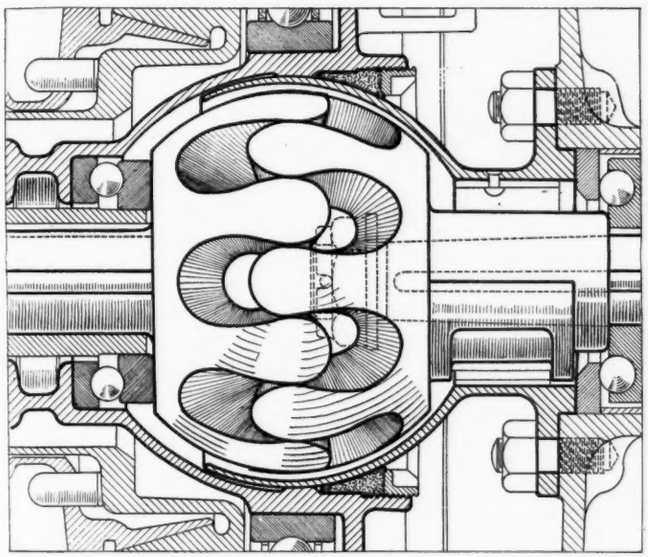
Novel Form of Universal Joint

Editor AUTOMOTIVE INDUSTRIES:

YOU will find enclosed a blueprint of a peculiar gear design (clipped from an axle assembly) which has come up in my work.

It is a gear of a spherical order used in a front or four-wheel drive on motor cars; when in the normal position there is no action between the teeth, they serving merely as a driving clutch; but when the front wheel is moved to the right or left, a rolling of the teeth in and out of mesh takes place. The working face of the tooth lies in a radial line from the center of the sphere.

It falls outside of anything in gear tooth curves that I have had any experience with. Can you give me any information as to how this tooth curve is generated or laid out and has there ever been a machine constructed in this country to cut a gear of this character; also, have you any idea along what line this could be accomplished in a manufacturing way? H. W. R.



Universal joint design

We have had no experience with this type of mechanism and cannot enlighten our correspondent regarding the necessary tooth form, etc., but possibly some reader can.—EDITOR.

Wood Wheels on Automobiles

Editor AUTOMOTIVE INDUSTRIES:

THE writer has read with much interest the article entitled "Engineering Problems of Long Distance Motor Transport," appearing in the May 27 issue of AUTOMOTIVE INDUSTRIES. Naturally I am particularly concerned with the comments and recommendations relative to the wheels, on page 1195.

To say the least, the writer takes a most definite stand in favor of metal wheels against wooden wheels, and to publish broadcast a statement of this kind without challenge or dispute is liable, in my opinion, to create a false and injurious impression.

From the tone of his statements against wooden wheels, it appears that Mr. Burton has allowed his judgment to be influenced by cases of individual wheel trouble on the convoy trip as positive evidence of the undesirability of wood wheels in general. He has simply cited an exception to the rule, instead of giving credit to the wonderful performances of wood wheels in the past and at present.

As a matter of fact, we heard from other engineers of the Motor Transport Corps that during the war, the percentage of failure of wood wheels, especially on Class "B" trucks, was infinitesimal. Furthermore, in his eagerness to recommend and advocate different forms of metal wheels, he has not taken into consideration the many well-known and proven disadvantages and defects existing in metal wheels, all of which I shall be glad to point out to him, if he so desires.

It is evident that an impartial judgment on this subject would be quick to realize that wood wheels have been in constant use for centuries and have always given good service. On the other hand, the metal wheel is not yet out of the experimental stage. Also it is a known fact that where one metal wheel is in use to-day there are literally thousands of wood wheels performing, and the proportion of faulty wood wheels is almost negligible in comparison to the number in use.

In justice to the members of the Automotive Wood Wheel Manufacturers' Association, representing the leading wood wheel manufacturers of this country, whose constitution calls for co-operation "with the United States Government in every possible manner," I am taking the liberty of requesting the definite data upon which Mr. Burton's conclusions, as outlined in the paper above referred to, are based. Thanking you in advance for your consideration.

S. V. LOVENSTEIN,
Chairman Research Engineering Division,
Automotive Wood Wheel Manufacturers' Association.

Book Reviews

AMONG the technical handbooks whose publication has been resumed after the war is the "Automobile Engineer Year Book for 1920." The new issue follows much the same lines as before, but a number of improvements have been made. The principal tables have been retained. These include tables for determining the piston displacement of engines in English and metric units, mathematical tables, conversion tables, etc.

As in previous editions, tabulated specifications are given of British, Continental, and American car chassis and of British truck chassis. To this has been added a table of specifications of British, Continental and American air craft engines. This table is especially complete. The formula for the figure of merit "K" for motor vehicles is given with several tables and many pages of discussion. The English-French and French-English glossary of automobile terms is again included and is very comprehensive.

The price of this edition, which is published by Iliffe & Sons, 20 Tudor Street, London, is 6/- net or 6/6 by post.

THE ENGINEERING INDEX. The American Society of Mechanical Engineers, 29 West 39th Street, New York City.

This is the first number of this useful series to be published by the society and contains some changes and additions. The number of magazines included has been trebled, as the Library of the Engineering Societies is now made available. The arrangement is changed to the dictionary type. As published by the Engineering Magazine Co. it was divided into sections corresponding to the principal divisions of the engineering profession.

WE have received a copy of the first issue of *La Carrosserie Automobile*, a French carriage publication devoted to automobile body work. The paper, which is published by The Atalier Riegel, Neuilly, Seine, was suspended during the war. No doubt some of our body designers will be interested in this publication.

Changes in Hours of Labor Depend Upon Various Factors

Discussions among manufacturers of the number of hours in the working day are confined to production and health. The worker will consider the demands of his social surroundings. The manufacturer must realize this or fail to understand the reasons for demands of his workmen.

By Harry Tipper

THE discussion which is constantly occurring about the number of hours of labor which would represent the best mechanical conditions for industry, together with the best adjustment to the workers' aspirations, is constantly going on, and the shortening of hours which has occurred in the last two or three years is being used by the trade unions largely as the basis for the demands of further reductions. These demands have alarmed the general public and industrial managers because of their probable effect upon the quantity of production and the cost of producing the unit.

It is interesting, therefore, at this time to look back over the course of development in industry for thirty or forty years and examine the situation with respect to the hours of labor and the changes which have been brought about. When this examination is made, it is evident that the demand for shorter hours has been one of the uppermost questions in the minds of the worker since the early days of the factory system, and it has for a good many years been a part of the propaganda of organization and the demands upon industry from organized workers.

In general, the hours of labor, when hand work was the usual method of production, carried right through the waking hours, and it was no uncommon thing for the workers to be employed for twelve or fourteen hours at their occupations in each day.

The change over to the factory system was accomplished without any change in the hours of work, but after the factory system was established the hours of work were gradually shortened to ten and in the last few years to nine and eight in a good many instances. It is true that in some instances the hours still remain at twelve in regard to particular occupations. In many commercial lines, however, the actual hours of work are less than eight, and the general tendency has been to shorten the required hours of labor. The excursions which have been made into the questions of physical fatigue have indicated that in the subdivided work necessary in the modern factory system the long hours which were previously general, such as twelve or fourteen hours, did not result in a production pace proportionate to the hours and reductions were made to ten and eight without having any material effect upon the rate of production.

The elements which enter into fatigue are not yet thoroughly determined and there are mental factors connected with the physical fatigue which have a good deal to do with the question of the length of the working day for profitable production. The point which is being brought out, however, is the existence of a definite tendency to reduce the hours of labor, which tendency has continued for a number of years and a very definite demand on the part of the worker that these hours should be limited.

In considering the length of the working day as it was in the hand labor period and the earlier part of the factory period, it is necessary to remember that the character of the work during this period provided a variety of operations which developed its own interest and which, at the same time, broke the continuity of the work, so that the work itself was not carried continuously to the length of time which is involved in the actual statement of the working day.

As the factory system developed, the character of the work itself changed, and the social organization also changed, so that the attitude of the worker toward the question of the length of the working day was affected very greatly by these changes. The development of the complex mechanical methods of production and their subdivision into innumerable fractional operations, necessitated an increasing attention to the regularity and the continuity of the work. In order that production should move rapidly and without confusion it was necessary that the operation in each case should be continued without interruption except at those regular periods when all the machinery of the factory was shut down. The mechanical character and the limitations of the equipment made it necessary for the operations to be performed with a regularity involving only a slight degree of tolerance.

This continued development in the necessity for continuity and regularity in the operation changed entirely the elements of fatigue and the speed with which the fatigue began to express itself. In the meantime, the social organization had changed sufficiently in character and in the size of its units so that the working operations ceased to have any visible connection with the social life of the worker, and the problem of living involved an average distance between the worker and his work which had its effect upon his agreement with the hours of labor indicated by the rules of the industry or the establishment.

The two most important factors, however, were the change in the character of the work and the gradual elimination of the connection between the work and the social surroundings. The change in the character of the work had an effect upon the mental attitude of the worker towards his work, which not only altered his incentive to continue at that work, but which, at the same

time, affected the actual physical fatigue arising from the work.

The absence of any visible connection between the occupation and the social surroundings destroyed the whole understanding that the social comfort depended upon the character and the efficiency of the work, and brought an entire change in the attitude of the worker towards the working period.

In the days when the skill of the artisan had its visible effect upon his social standing and his position among his neighbors, the working period was an orderly part of his incentive of social advancement and accomplishment. The connection between his skill as a worker and his standing as a neighbor was sufficiently visible to affect his whole attitude towards the working period. When this ceased to exist the attitude of the worker towards his work gradually changed until it became very little more than a necessary interruption in the real objects of his life.

His skill as a craftsman no longer affected his standing as a neighbor. It did not enter into his social relations and there was no visible connection between it and his necessary convenience, except the amount of money which he could make therefrom. The work, therefore, ceased to be a part of his life aspirations and became largely a necessary evil or nuisance or interruption to be borne, because only by that means could the money be secured which was required to support his home, to provide the necessary food and the amusement.

The change in the character of the work, its demand for a greater degree of regularity and continuity, have had their effect in producing a more rapid fatigue and a more definite accumulated fatigue, this fatigue arising both from the limitation of the required physical effort and the deadening of the incentive through the regularity and continuity of the work.

The answer of industry to the demands of the worker for shorter hours in the past has been a final assent to the shorter hours demanded, or a compromise between the demands of the workers and the ideas of the manufacturers. No matter how much the owners of industries and the general public may have objected to these demands, in the long run the worker has succeeded in reducing the hours in most lines by a very considerable percentage in the last twenty-five years.

In view of the present demands of labor for still shorter hours, and the evident importance of that demand in the eyes of the worker, it is reasonable to suppose that industry will be obliged to face the possibility of further reduction and prepare itself to meet these reductions by better organization.

The earlier reduction in the number of hours led to the invention of more machinery and of a more automatic character so that the men could perform more operations in a given time, to better production advantage. The necessity for more rapid production in a shorter working day and the great advance in the healing arts have enabled the manufacturer to determine some of the elements of fatigue sufficiently to find out that the amount of work is not governed by the mechanical capacity of the equipment and is not necessarily increased or decreased in proportion to the number of hours which comprise the working day.

In the earlier part of the development of this mechanical equipment, in the past thirty or forty years, the advance in machinery and methods were of sufficient importance to take care of any drop in the individual man-power due to the shorter working day, and at the same time produce with much greater rapidity. In many lines of industry, however, the mechanical equipment has arrived at a sufficient state of perfection to make the additional advances much slower in their development and affecting the total result to a very much smaller degree. Consequently, it is unlikely that any serious reduction in the number of working hours can be immediately effected by improvement in the machinery, which will take care of the new limitations in the man-power day. An examination of the mechanical equipment and the methods of manufacturing in many lines of industry will show that with all the great advance which has been made lately, the earlier advance effected a much greater proportionate saving to the total result and effected a much greater percentage of the operations.

If the tendency to reduce hours to some extent is continued in this or other industrial countries, the importance of studying the human side of organization will be reinforced and it will become more than ever necessary for the manufacturing executive to find out how to harness the incentive and the other potentialities which make the difference between the average or minimum pace and the maximum pace. The mental factors which enter into fatigue will then be understood as the most important factors in the visible fatigue of the worker, and, consequently, the most important influence affecting his attitude towards his work and towards industrial development.

It has been the obvious necessity of industry at all times to adjust itself to the changing social conditions and the changing economic requirements. The questions which are involved in the disturbances between labor and capital represent a part of this problem, and those industries will be pre-eminently successful that have given the greatest study to these human factors and have developed with the greatest care the adjustments which must be made in order to meet the changed conditions.

It is to be observed that the general discussion upon the number of hours in the working day or week among manufacturers and executives of industry are usually confined to the question of production, the question of health, and so forth. It must be remembered that the worker will always take into account in his demands of his social surroundings. No manufacturer will understand the reason for the worker's demands or the factors which enter into them unless he views them not only from the industrial standpoint, but from the social standpoint as well.

Sir Auckland Geddes said, the other day, that workers were getting tired of working a whole lifetime to bring up a family who would be condemned to continue the same work and with the same outlook. Whatever may be thought about the matter, this side of the question must be considered in connection with the limitation of the working day and how it will be met by industry in connection with its production necessities.

FOR the past four years the French Government, with a view to encouraging the national agriculture, has paid subsidies at the rate of 50 per cent of the purchase price on the purchase of farm tractors of native construction and 33⅓ per cent on tractors of foreign manufacture. The numbers of tractors purchased and for which the subsidy was demanded were as follows: Domestic manufacture: 1916, none; 1917, 7; 1918, 241; 1919, 2518; foreign manufacture: 1916, 46; 1917, 154; 1918, 124; 1919, 53. Of the 2518 tractors purchased in 1918 for the interior regions not devasted during the war, subventions were allowed on 1228. The demands for a subsidy on the other 1290 remain in abeyance owing to lack of available funds.

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Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907, and The Horseless Age (semi-monthly) May, 1918.

Anachronic Gas Regulations

GAS companies in many parts of the country are operating under regulations which compel them to furnish gas which when burned in a jet consuming a certain number of cubic feet per hour, gives a certain number of candle-power. In order to obtain this luminous efficiency, they have to enrich the gas with petroleum vapor, and what is known as gas oil is generally used for the purpose. The extensive use of petroleum distillate for the enrichment of coal gas is one of the causes for the present shortage of motor fuel. Little could be said against this practice if it accomplished any real good. At the time the regulations above referred to were enacted, coal gas was used mainly for lighting purposes in open burners, and the candle-power given by a burner consuming a certain quantity of gas per hour was a true measure of the quality or value of the gas. But to-day practically no gas is used for illuminating purposes in open burners; a large proportion of the gas sold by the gas companies is used for industrial purposes and for cooking, and what gas is still used for lighting is used in mantle burners. In all these applications it is the heating value that really determines the merit of the gas, and the light given off when the gas is burned in an open flame is an entirely wrong criterion. Still these antiquated regulations continue to be enforced, and the gas companies compete in the petroleum market for products that are ever getting scarcer.

In many industrial lines petroleum fuel is legitimately used, because of its convenience or economy, but this cannot be said for the use of petroleum products for enriching coal gas to-day. The automotive industry, whose future is so closely bound up with the preservation of our supplies of liquid fuel, should institute a determined campaign to have all such ordinances and regulations repealed. Action along this line is even more urgent than promotion of the good roads movement; no irreparable loss will be caused by delay in the roads building program, but once our oil resources are exhausted it is too late to look for a remedy.

The Export Volume

WITHIN the last few days two evidences of the foreign view of the American automotive industries have come to hand in which it was stated that this country would export 1,000,000 passenger cars during 1920. Each statement was made in apparent good faith and sincerity, one at London by a well-known trade organization, and the second in South Africa.

The misconception of these two views is too apparent when it is remembered that the 1919 exports from this country were less than 70,000 cars and that the 1920 production will not exceed that of 1919 by any such ratio of comparison. But it is a compliment to the American industry to consider such a huge export total as even possible, just as it is a commentary upon the world's demands for the cars made in the United States.

Paying for Labor

RECENTLY in a mid-west city a public utility contractor advertised for laborers at $1.10 an hour. That same morning every factory in the city felt the unrest that resulted. It was two weeks before labor learned the facts behind this ad and settled down to the previous stage of just ordinary unrest. The facts were that the men were not sought simply as laborers, but for "sandhog" work under air pressure, a work that for years has been paid at a high rate.

By printing this fictitious offer, the contractor obtained one or two men who worked a few days, but, before he made any real progress, he was compelled to advertise openly for the kind of labor he sought, and in the meantime he had created a very strong prejudice against the company he represented. Some day that company must pay the price for this dishonesty, to say nothing of the cost to workers who lost their time answering the advertisement.

Production—A Human Problem

PRODUCTION without human co-operation is impossible. The finest system that can be invented is but a hollow shell. It is an element in the success of a manufacturing plant, but without contented workmen, and that means busy workmen, no system can be of any avail.

The cornerstone of a successful manufacturing structure is a mutual understanding on a basis of a square deal between the employer and the employee. It must be understood by the workman that he is climbing his own ladder to success. Extra effort of hand or brain should bring reward and should result in added profit both to the man and to the organization. A factory filled with men having this knowledge and belief in their work and their employers will not be troubled by discontent. An employee who works enthusiastically does so for two reasons, first because he likes his work, and second because he is being paid for it.

The restlessness during the past few months has been natural. The value of the dollar has changed. Prices, wages and a great many relative ideas had to change with it. To accomplish this throughout the complicated maze of industry without some turmoil would have been impossible. To have virtually accomplished it in such a relatively short time and with so little real trouble is a credit to the country, but that is what might have been expected from a nation with the high average of education that is one of the most fortunate possessions of the United States.

Industry has one more task before it will be going full speed ahead. It must put production ahead of demand. When that is accomplished the period of high tension will have been passed. We will become the exporting nation that we should be in order to restore our proper trade balance with the world. Prices will seek their proper level and there will be no necessity for artificial methods of deflation.

We have our great manufacturing systems, the remaining problem is that of the human being. When labor is in the frame of mind to return a dollar's worth of work for a dollar and industry is anxious to pay a dollar for a dollar's worth of work, with the earning capacity up to the man himself, there will be no problem. Men will work if there is an incentive. In times of stress when unemployment exists, men may work hard because they are afraid of their job, but this is not a healthy condition. The proper incentive is that of ability to earn. In other words, it is compensation for honest effort.

As a prominent manufacturer pointed out at the recent summer meeting of the Society of Automotive Engineers at Ottawa Beach, Mich., it will take a generation of square dealing to overcome the justifiable suspicions of the worker. That is the task ahead of industry. It presents a big human problem, but there is no reason why the automotive industry, with its spirit of progressiveness, should not lead the way.

Federal Reserve Has NOT Placed

Harding Reiterates It's Up to Each Bank

Declares Board Has Placed No Restrictions on Members as to Loans

WASHINGTON, July 6—The Federal Reserve Board has placed no restrictions on member banks of the system in the matter of extending credits on automotive securities, according to statements made at the office of W. P. G. Harding, governor of the board, to-day. The individual banker is entirely free to exercise his discretion and it is his privilege to make a loan to one truck or tractor manufacturer and decline to honor the application of another. Officials at the office of the board declared that the board recognized the necessity for extension of such credits as may be necessary to promote production of essentials and that the member banks are guided to a great extent by this policy.

In a letter relative to curtailment of credits, Governor Harding said that he did not believe it necessary to advise member banks as to the eligibility of paper which is defined under the terms of the Federal Reserve act and the regulations of the board.

Wherever refusal has been made by member banks of the Federal Reserve System to discount automotive paper, the action has been taken at the initiative of the individual bank and not through regulations from the governing board. The matter, therefore, according to officials of the board, is purely personal with the different banks and discount may be refused if the individual bank so decrees.

No Class Restriction in Chicago District

CHICAGO, July 6—The Federal Reserve Bank of Chicago has shown no disposition to place any restrictions on automotive credits of any sort. The bank has never refused to rediscount automobile paper of any kind and is continuing to handle it, regardless of action which may have been taken in other districts.

These facts were made clear by officials of the Federal Reserve Bank here to-day. These officials declared they had no official knowledge that Kansas City and Atlanta banks had refused to rediscount automotive paper, their only information of such action being based on what they have read in newspaper reports and in business papers.

Truck and tractor paper is judged here solely upon its merits, just as commercial paper of any other sort. Issuance of credits on such paper is a matter for the decision of the individual banks to decide and the Federal Reserve Bank will rediscount such paper when it carries the endorsement of responsible dealers or firms. In this respect, automotive paper is handled just the same as commercial paper of any other kind.

Officials of the Chicago Reserve Bank emphasize the fact that they have never attempted to class any industry as essential or nonessential, and declare they will not do so except on direct orders from the Board of Governors of the Federal Reserve System, regardless of action which may have been or may be taken elsewhere in the United States.

AUTOMOTIVE INDUSTRIES believes many of the banks throughout the country which are discriminating against automobile paper are laboring under a misapprehension as to the position of the Federal Reserve Board and most of the Federal Reserve banks.

The board itself has directed no campaign against automobile paper as such. It has permitted the district banks to decide for themselves what is essential and what is not. A few of them, notably Kansas City and Atlanta, have placed automobiles under the ban. No such action has been taken, however, by New York and Chicago, which are by far the largest of the banks.

The New York and Chicago banks treat automobile paper exactly as they would any other commercial line. Whether or not it is accepted depends upon who issues it. Even the Kansas City bank has ruled that it will accept for rediscount truck and tractor paper if it is properly executed.

Statements from Governor Harding and officers of several of the district banks are presented herewith. If called to the attention of member banks which now shudder at the mere mention of automobiles as security for loans, they may prove illuminating and enlightening.

BOOK TO SHOW LOAD ABUSES

NEW YORK, July 3—The motor truck committee of the National Automobile Chamber of Commerce has directed the publication of a booklet which will point out the evils of overloading trucks. One of the chief of these is the damage done to highways. The authors will be Robert O. Patton, Pierce-Arrow Co., and F. C. Horner, Packard Motor Car Co.

New York District Not Discriminating

Biggest Bank in System Handles Automotive Paper Like Other Commercial Lines

NEW YORK, July 6—Automotive paper for credit extension is being handled by the Federal Reserve Bank of the New York District just as any other commercial paper, according to a statement made at the offices of the bank here. The bank has "quite a little" of such paper on hand, it reported, and has had no word to refuse it. The only requirement is that it must be in eligible condition with indorsement such as would carry any other paper to completion of a loan.

The question of refusal or acceptance of automotive paper by the various member banks is left to the decision of the individual institutions, no restricting regulations having been adopted by the Federal Reserve Board, it was stated at the New York Bank. Nor is any distinction made between the type of automobile offered, whether truck or passenger car. If the paper does not meet with the individual requirements of the bank, it is, just as any other unsatisfactory commercial paper, turned back, but any inference that such collateral is refused for credit extension because it is automotive paper was denied emphatically.

It was explained at the New York offices that each member bank in the Federal Reserve has, besides the general regulations of the entire system, its own regulations as to the paper it shall deem acceptable, but that the eligibility factor depends on the actual value of indorsement and collateral, rather than on whether it is secured by automobiles of any type.

Deny Responsibility for Bank Refusals

DALLAS, TEX., July 6—Denial that the Federal Reserve Bank here is responsible for refusals of automobile and tractor loans was made here to-day by Lynn P. Talley, Deputy Governor of the Federal Reserve Bank for the Eleventh District.

"We have nothing to do with these loans being turned down," he declared. He refused further comment and said that the banker himself was the one to explain why loans are refused on such securities.

According to R. L. Thornton, president of the Dallas County State Bank,

(*Continued on page* 95)

Official Ban on Automobile Paper

Manufacturers Help Lift Credit Strain

Need for Greater Transportation Helps Re-establish Automotive Business With Banks

NEW YORK, July 3—Manufacturers are concerning themselves more and more with the troubles of their dealers, according to information brought back by Alfred Reeves, general manager of the National Automobile Chamber of Commerce, after a trip through the Central West. The dark clouds on the dealers' credit horizon, which have inclined some of the more timid to seek their storm cellars, show signs of lifting a bit, although there is no reason to expect they will vanish in the immediate future.

Education is the main factor in bringing about a change in the attitude of bankers. They are being sold on the fact that automobiles are transportation. They are learning that until there is more transportation there can be no easing of railroad congestion and the consequent danger of industrial paralysis.

At least one passenger car company reports that its representatives have talked with the bankers in many of the smaller towns where they have dealers and the banks have agreed to a loosening up of credit. There is a steadily expanding disposition to regard the reputable dealer, who is on a sound business basis, as a merchant rather than a parasite. To these men most banks will extend enough credit to carry them on a living basis.

Dealers will not be able to continue on the scale to which they have become accustomed and they will be able to do very little business on a credit basis, but they will be loaned enough money to enable them to make a living. Those who have been stocking 25 cars may not be able to stock more than 5 or 10, but they will be permitted to handle that many.

Out of Touch with Banks

One of the faults manufacturers find with their dealers is that they have gotten out of touch with their banks and they are urged to see their banker at every opportunity, losing no chance to sell him on the importance of motor transportation.

It is believed the worst is over for the truck dealers who have been having credit troubles. Bankers in the smaller places are becoming more familiar with the underlying economics of the present situation. They are realizing that everything must be done to expand transportation and that the motor truck is the best means available. It is possible that time sales of trucks may be allowed to a greater extent where the purchasers actually need them. One middle western company reports that it has arranged to finance its dealers.

Up to the present time the dealer seems to have been the chief sufferer. The manufacturers do not view the conditions which now prevail as an unmitigated evil. They feel that perhaps the industry was expanding a bit too fast and that it may be well to get it back on a more normal basis. If it does nothing else it will give them an opportunity to solve some of their labor troubles and balance their inventories.

On his trip Reeves visited Detroit, Chicago, Cleveland, Indianapolis and smaller towns in Indiana. In Indiana he visited many dealers and bankers to discuss conditions with them. He also attended the S. A. E. summer meeting.

50% First Payment Now Asked on Cars

KANSAS CITY, July 3—A prominent local financing corporation has cut its credit terms on passenger cars to a 50 per cent first payment basis with ten months allowed to complete the payment. Formerly this company required the purchaser to take out fire and theft insurance. It now demands fire, theft and collision insurance. Formerly passenger cars financed through this company were made on a 25 per cent first payment basis with twelve months allowed to complete the transaction. Terms for financing trucks and tractors are on a 33 1/3 per cent basis for first payment with twelve months allowed to complete the deal. The high rate of interest required by the banks for handling automobile paper was a prominent factor in the credit cut. Many out-of-town dealers handle their paper through the Kansas City financing companies.

Country banks in this territory handle very little automotive paper, according to local bankers. The small town banker is afraid of automobile paper and many sales in rural communities are made on a cash basis. The paper taken by the country dealer is financed through the large city dealers or floated by the country dealer in the city bank. A large amount of country automobile paper is reported in circulation in Kansas City at the present time.

Southeast States Feel Credit Cuts

Bankers Cut Down on Automotive Credits—Finance Companies Curtail Business

RICHMOND, July 2—Four of the big agricultural States of the Southeast—Maryland, Virginia, North and South Carolina—are just beginning to feel the full effects of the credit stringency and trade slackening which has been taking its toll out of the automobile business in the North and West for several weeks. Bankers of the district, which includes the States named, are exercising extreme caution in handling automobile paper.

There has been some out and out discrimination, under which banks have refused to finance time sales to persons thoroughly capable of buying and operating cars and seeking credit only because they wanted to use part of the car's purchase price in immediate business transactions. In the main, however, the bankers have been content to look with unusual care into the inventories of dealers applying for credit.

The financing companies operating in the four states have been forced to curtail in a large degree. This has further crippled the activities of some dealers.

Even dealers maintaining sizable bank balances have found themselves in the past week unable to obtain all the funds they desired for development of plans for fall and winter business.

Despite conditions, the majority of dealers have been able to make arrangements to continue business without extensive curtailment. The newspapers of the territory have printed some strong editorials upholding the utility of automotive products.

Bank Resources Ample

Dealers report that in some cases claims of banks that the demands for credit were greater than their resources will not hold water. Some banks, while restricting on local credit, are loaning money in New York and other financial centers on high interest call security.

At the offices of the Federal Reserve Bank here it was stated that no discriminatory order had been issued against automobile credit. It was necessary, according to the statement, that banks retain sufficient funds to meet the crop raising and moving demands of states devoted principally to agriculture, which necessarily restricted loans to other interests. It was also stated that bankers were using their own judgment entirely on loans to automobile interests and were meeting the demands of concerns rated as good risks.

Drop in Production Eases Labor Strain

Many States Show Unemployment, but Little General Idleness—Strikes Abate

NEW YORK, July 3—Reports from a score of states indicate that a gradual change is developing in the labor situation. There is considerable unemployment in some sections, although idleness is by no means general. Probably as a consequence labor is showing less of an inclination to strike and a more conciliatory attitude. Most of the unemployment is due to railroad congestion which is holding up industry, but a not inconsiderable share of it is due to curtailed operations due to a falling off in demand. This is particularly true in the textile field and in boots and shoes.

A synopsis of labor conditions in the different states follows:

Pennsylvania—Temporary part time unemployment in some of the textile industries and some other lines because of lack of fuel, raw materials and car shortage. Strikes in building trades and foundries.

Massachusetts—Demand for labor is very good except in textile and shoe plants, which are curtailing or closing. There has been a decided reduction in the number and magnitude of strikes.

New Hampshire—Production curtailed in some shoe factories and textile mills by putting workers on part time basis.

Connecticut—Textile industry has slowed down, many of the plants working only four days a week.

New York—There has been a decrease in the demand for help in the textile and clothing trade. Reports are heard of plans to lay off large numbers of workers in other lines. No surplus is apparent of skilled hands.

Florida—There is a surplus of skilled labor, especially in the building trades.

Georgia—Shortage of labor on farms is the greatest in the state's history. Demand is steady for all classes of labor.

Maryland—Any able bodied laboring man, skilled or unskilled, can easily obtain work at adequate pay.

Ohio—Steel mills operating at about 50 per cent normal because of transportation difficulties. Thousands of miners are out of work for the same reason. Building trades operations are slowing down because of lack of materials and finances. There is no demand for mechanics of any kind. No improvement is looked for until the transportation problem is solved.

Minnesota—There is no unemployment unless by choice of labor. Farm help is scarce.

Wisconsin—The demand for labor is about as keen as ever but the fuel shortage is critical and may force factories to close.

North Dakota—Small surplus of unemployed is reported, which may be absorbed on the farms. There also is a slight surplus of skilled workers.

Nebraska—There is a surplus of men wanting farm work by the day and a surplus of men for construction work.

Oklahoma—Some communities report small surpluses of building mechanics. Indications are employment may become somewhat general in the building trades. Farm labor shortage has been overcome by influx of men from other states where harvests have been delayed by bad weather.

Kansas—Difficulty encountered in diagnosing labor situation because of the demand for 50,000 men to harvest the wheat crop.

Wyoming—Sufficient demand apparent in various industries to absorb what idle men there are but idle men show no disposition to go to work.

Colorado—Supply of labor is equal to the demand but harvest help will be needed soon.

Washington—Lumber industry is slowing down and the supply of labor in shipbuilding is much greater than the demand. Twenty per cent of the factories have reduced their help because of cancelled orders. Large mercantile establishments laying off men for the same reason.

Oregon—Logging and lumbering operations are slowing up. Influx of "floaters" from other states has added to unemployment in Portland. It is difficult to get men to accept farm work.

British Tire Makers Control Home Markets

LONDON, June 18 (*Special Correspondence*).—According to the American Chamber of Commerce in London, the report that large quantities of American and French tires were being dumped on the British markets to the disadvantage of British manufacturers is dispelled by the information given by the secretary to the Board of Trade.

He stated that during the first five months of this year the export of tires exceeded in value the imports by over £600,000 sterling, and that in the corresponding period of 1914 imports exceeded exports in value by £470,000 sterling.

The inquiries, says the American Chamber, are stated to have emanated from the report that a well-known firm of tire manufacturers found it necessary to dismiss a large number of workmen and this was attributed to the dumping of foreign tires, but the official figures show that the position of the British tire industry has been entirely reversed from that of pre-war days.

SAMSON OPENS DALLAS OFFICE

DALLAS, July 1—Southwestern headquarters for the Samson Tractor Co. of Janesville, Wis., were opened in Dallas to-day. This company is a division of General Motors and manufactures tractors, trucks and farm implements. A complete office and sales force will begin work at once and as soon as business in the Southwest warrants an assembling plant will be erected here.

Federal Highways Total 13,540 Miles

Report Shows This Mileage Built Or Under Construction—Preliminaries Cut

WASHINGTON, July 3—The remarkable rate at which the number of Federal-aid road-building projects has increased since the war is shown in a summary relating to all such work from Sept. 30, 1916, to April 30, 1920, which has been prepared by the Bureau of Public Roads, United States Department of Agriculture. On the latter date the States had filed with the bureau 2885 project statements, of which 2790 had been approved, representing 27,796 miles of highway.

The totals on April 30, 1919, were little more than one-third these amounts. Up to May 1 of this year 1974 projects had proceeded to the stage at which plans, specifications and estimates had been delivered to the Bureau of Public Roads. The plans, specifications and estimates of 1827 of these had been recommended for approval, representing 13,845 miles.

Project agreements had actually been executed and construction work was in progress on 1569 projects, totaling 11,987 miles. In addition, work had been begun on about 100 projects for which agreements had not actually been signed, thus expediting the progress of the work and bringing the total mileage under construction up to 13,540. The summary shows that a great reduction has been made in the time required for preliminary work before actual construction is begun.

On the average the States have submitted project statements for nearly 95 per cent of their respective allotments and have entered into agreement to construct highways which call for about one-half of their Federal-aid money.

EXTEND DETROIT BUS SERVICE

DETROIT, July 2—Detroit Motorbus Co. will put on seven additional buses about the middle of July and will extend the bus service to all sections of the city as rapidly as the vehicles can be secured. R. W. Meade, president of the company, announced this week that the R. and V. Knight engines had been adopted for the motorbus to the exclusion of all other types. This is in line with the policy of Meade in installing Knight engines on the New York motorbus line.

SHIMPF POSTPONES NEW CAR

NEW YORK, July 1—Walter H. Shimpf has deferred action on his project of bringing out a new car, to be called the Larchmont, in Newark, N. J. Shimpf, formerly with the sales organization of the Paige truck, has become interested in A. H. Lyons & Co., storage battery manufacturers of Philadelphia, as sales manager.

Factory Work Urged for Young Engineers

Hudson Head Emphasizes Need for Co-operation Between College and Industry

ANN ARBOR, MICH., July 2—Emphasizing the need for co-operation between the educational institutions and the industries of the country in the training of engineers and the necessity for practical effort along with the theoretical education, Roy D. Chapin, president of Hudson Motor Car Co., read an interesting paper before the National Society for the Promotion of Engineering Education in session here. Lengthy discussion followed the paper, all of the educators present indorsing the plan for factory work by students during the vacation season in gaining a practical knowledge of the profession.

Chapin told the convention the man who emerged from the university with a practical knowledge of engineering to add to his scholastic preparation would be in position to secure compensation from 20 to 50 per cent greater at the start than the man who entered industry with nothing save his university diploma. He urged also that the remuneration for services during the vacation period would be a big factor and declared in no other way could a student secure knowledge of the various departments in an industrial institution, with which he would have to co-operate and harmonize upon entering after graduation.

Several instances had come to his attention, Chapin said, where engineers had expressed regret that they had not taken advantage of opportunities to get a practical knowledge while completing their university course. He said they felt themselves lacking in self-confidence as a result of their lack of business training, and he urged that every engineering student in addition to his technical training should take a certain number of courses in business administration to furnish the groundwork for later executive opportunities and a truer aspect as to commercial engineering.

Practical Work in Vacation

Practical education during the vacation periods, Chapin said, would enable students to find out before their graduation if they were for any reason unfitted for the line of engineering they had chosen for a profession, and permit of their diversion to other lines. The lack of practical training in the university, he said, necessitates such training after graduation, holding the graduate back until he has secured the combination of both theory and practice.

"In general," said Chapin, "the most successful engineers are those in whom you have developed a commercial instinct which so guides their engineering work that the results pay out. The engineer should think outside his job. He should have the courage to take responsibility and go ahead. To do this he must have a solid foundation of well rounded training, and it is the consensus that as yet you are not furnishing that solid foundation for the average graduate.

"The majority of the engineering graduates appear to have acquired the information imparted to them in college, but few of them have learned to apply that information in practice. The engineer should have a sufficiently broad conception of the functions of the various executive departments and the relationships between them and his own to endow him with a sympathetic understanding of their difficulties and problems. As a matter of fact an engineering graduate in the factory is a liability for some time.

"America is entering on a period of enormous industrial expansion and with her rapidly growing export trade our engineering methods rapidly are coming into competition with those of the European engineers. It is your desire naturally to lead the world, and this is expressed best in the quality of work turned out by the graduates of your institutions.

"Give these men during their college course a more thorough practical insight into the everyday problems they will encounter after graduation, even though it takes years to build up the practical contacts necessary."

Await Rail Award to Improve Service

NEW YORK, July 3—J. S. Marvin, secretary of the traffic committee of the National Automobile Chamber of Commerce, has returned from a trip which took him to Washington, Detroit, Cleveland and Indianapolis. At Washington he labored with the Interstate Commerce Commission in an effort to ease the restrictions on cars for the use of the industry and met with some success.

In the other cities Marvin held meetings to discuss general traffic conditions. He found little change in the situation. The most encouraging aspects of the railroad outlook are that decisions soon will be reached in relation to wages and rates. If the Railroad Labor Board gives an increase, as it undoubtedly will, it is likely to bring about a much needed improvement in the morale of railroad workers. When the I. C. C. decides upon the scale of rate increases they will be placed on a permanent foundation and can cut their cloth accordingly.

Manufacturers have ceased to depend to any extent upon freight cars to ship their products and are relying almost entirely upon driveaways. It is estimated that from 12,000 to 14,000 men are engaged in this work throughout the country.

OAKLAND STARTS NEW UNIT

PONTIAC, MICH., July 2—Ground was broken this week for the construction of the $3,000,000 addition to the Oakland Motor Car Co. plant, which will double the output of the factory. Production facilities to enable the company to do work which now is done in other cities will be installed in the addition.

Purchasing Agents Protest Coal Order

Charge Assigned Car Principle Will Give Unfair Advantage to Railroads

NEW YORK, July 3—The National Association of Purchasing Agents, composed of the representatives of 3500 manufacturing establishments in all lines of industry, has sent to the Interstate Commerce Commission a protest against the re-establishment of the "assigned car" principle in connection with the bituminous coal supply. It is held to work to the great advantage of the railroads to possess the power to assign cars to mines, the output of which they use wholly or in part but to be unfair to the rest of the industry.

"In effect," the statement says, "the practice insures the railroads a full supply of fuel at prices virtually of their own making. It obliges industrial consumers to bear the burden of tremendously increased prices for the wholly inadequate remainder of the coal supply.

"The effect upon general industry of existing conditions in the bituminous coal fields is typified by the experience of the concerns represented in our membership which may fairly be said to be thoroughly representative of American industry. One of the most important duties devolving upon our members is the purchase of fuel for the operation of their respective plants. The critical conditions in the bituminous coal fields with the logical assumption that the conditions are likely to become worse in the closing months of the year inspire us to go on record as favoring the establishment of regulations which will alleviate the insufferable conditions imposed upon the industrial purchaser of coal and will tend to minimize and equally apportion the burdens resulting from the lack of production and consequent inadequate supply of bituminous coal."

Accountants Seek Uniform Cost System

PITTSBURGH, July 2—Representatives of trade and industrial associations have organized the Industrial Cost Accountants Association, with headquarters in the Peoples' Bank Building, this city. M. F. Simmons, supervisor of costs, General Electric Co., is president, and A. A. Alles, Jr., secretary of the Fawcus Machine Co., is secretary-treasurer.

Alles, who is a member of the American Gear Manufacturers' Association, has been in communication with most of the industrial organizations and has found that virtually all of them are convinced that the solution of their most serious problems lies in uniform cost accounting. All of them showed enthusiasm over bringing about such a system and the formation of the association was the result.

Automotive Exports for May

COUNTRIES	Commercial				Passenger				
	Complete Cars		Chassis		Complete Cars		Chassis		Parts
	Number	Value	Number	Value	Number	Value	Number	Value	Value
Azores and Madeira Islands	.....	.....	.....	.....	1	$483	.....	.....	.....
Belgium	.....	.....	.....	.....	163	$196,733	21	$41,904	$461
Bulgaria	.....	.....	.....	.....	9	$12,000	.....	.....	$88,298
Denmark	36	$67,414	11	$29,373	80	$99,513	2	$5,750	$474,684
Finland	.....	.....	.....	.....	2	$6,209	.....	.....	$3,360
France	.....	.....	.....	.....	21	$35,169	2	$2,500	$822,205
Gibraltar	.....	.....	.....	.....	12	$10,158	.....	.....	.....
Greece	7	$7,600	1	$670	86	$75,200	7	$4,600	$15,946
Hungary	.....	.....	.....	.....	.....	.....	.....	.....	.....
Iceland and Faroe Islands	.....	.....	.....	.....	1	$3,000	.....	.....	$2,786
Italy	.....	.....	.....	.....	32	$28,457	70	$87,799	$62,010
Malta, Gozo and Cyprus Islands	.....	.....	.....	.....	20	$16,544	.....	.....	$1,215
Netherlands	1	$3,790	10	$9,363	339	$271,276	5	$15,000	$16,192
Norway	45	$75,675	33	$56,659	491	$554,705	.....	.....	$39,252
Poland and Danzig	1	$3,780	5	$2,112	19	$22,544	.....	.....	$54
Portugal	2	$3,005	2	$3,960	19	$21,308	.....	.....	$5,100
Roumania	.....	.....	.....	.....	6	$5,238	.....	.....	$3,567
Russia in Europe	.....	.....	.....	.....	.....	.....	.....	.....	$25
Spain	57	$93,710	44	$60,005	397	$503,523	34	$27,012	$87,661
Sweden	29	$57,156	18	$35,679	661	$696,348	10	$7,205	$13,913
Switzerland	.....	.....	.....	.....	84	$93,271	7	$8,100	$4,113
Turkey in Europe	.....	.....	.....	.....	18	$22,836	.....	.....	$1,751
England	330	$441,941	360	$468,059	1,995	$2,139,846	147	$184,810	$612,477
Scotland	3	$5,100	12	$10,424	49	$49,509	.....	.....	$2,312
Ireland	.....	.....	12	$7,626	87	$111,242	.....	.....	$6,890
Jugoslavia, Albania, Etc	3	$1,511	.....	.....	8	$4,731	.....	.....	$200
British Honduras	.....	.....	3	$1,800	5	$5,000	.....	.....	$1,028
Canada	179	$349,372	137	$304,183	896	$1,289,498	40	$49,700	$2,107,377
Costa Rica	.....	.....	.....	.....	13	$11,790	.....	.....	$1,548
Guatemala	1	$1,000	.....	.....	19	$22,736	.....	.....	$2,388
Honduras	1	$5,469	.....	.....	2	$1,535	.....	.....	$2,230
Nicaragua	.....	.....	.....	.....	12	$19,805	.....	.....	$4,224
Panama	.....	.....	2	$1,007	36	$27,279	.....	.....	$11,308
Salvador	1	$2,911	1	$6,642	19	$33,699	2	$3,950	$4,594
Mexico	87	$108,831	10	$16,717	234	$188,998	.....	.....	$76,442
Miquelon, Langley, etc.	.....	.....	.....	.....	.....	.....	.....	.....	$27
Newfoundland and Labrador	1	$1,639	.....	.....	8	$11,213	.....	.....	$3,408
Barbados	1	$2,350	.....	.....	6	$2,899	.....	.....	$4,220
Jamaica	15	$40,946	16	$8,059	24	$20,309	3	$9,504	$22,830
Trinidad and Tobago	1	$2,000	16	$8,060	9	$14,760	.....	.....	$7,575
Other British West Indies	.....	.....	.....	.....	1	$1,250	.....	.....	$2,359
Cuba	157	$383,416	78	$202,700	434	$541,771	4	$2,215	$223,411
Virgin Islands of U. S.	.....	.....	.....	.....	5	$4,049	.....	.....	$9,825
Dutch West Indies	.....	.....	3	$1,511	10	$6,915	.....	.....	$316
French West Indies	19	$12,785	1	$600	7	$6,573	.....	.....	$10,698
Haiti	.....	.....	.....	.....	34	$19,462	.....	.....	$6,486
Dominican Republic	2	$3,575	14	$7,054	46	$39,294	.....	.....	$23,830
Argentina	33	$86,275	7	$18,242	439	$473,225	18	$7,748	$888,358
Bolivia	1	$2,850	.....	.....	1	$1,530	.....	.....	$2,279
Brazil	113	$84,911	57	$34,974	382	$412,928	3	$5,441	$326,273
Chile	2	$4,644	56	$32,674	136	$84,455	2	$1,474	$36,759
Colombia	17	$20,037	6	$4,919	77	$79,267	4	$2,012	$18,781
Ecuador	.....	.....	.....	.....	.....	.....	.....	.....	$1,215
British Guiana	.....	.....	.....	.....	2	$2,762	.....	.....	$6,287
Dutch Guiana	.....	.....	.....	.....	.....	.....	.....	.....	$89
French Guiana	.....	.....	.....	.....	1	$3,364	.....	.....	.....
Paraguay	.....	.....	.....	.....	.....	.....	.....	.....	$388
Peru	2	$7,394	3	$12,900	112	$80,173	10	$4,419	$34,396
Uruguay	.....	.....	2	$1,815	260	$342,682	10	$6,222	$32,390
Venezuela	12	$9,187	5	$2,519	131	$103,227	10	$4,834	$13,026
Aden	.....	.....	.....	.....	11	$9,210	.....	.....	$4,378
China	12	$30,465	12	$24,031	172	$177,061	6	$7,156	$9,914
Kwantung, leased territory	.....	.....	.....	.....	1	$2,995	.....	.....	.....
Chosen	.....	.....	.....	.....	305	$149,939	246	$114,890	$2,354
British India	36	$63,157	49	$106,085	1,198	$1,281,992	4	$11,084	$84,522
Straits Settlements	16	$40,032	13	$17,319	198	$232,184	.....	.....	$34,276
Other British East Indies	.....	.....	.....	.....	27	$30,601	.....	.....	$1,687
Dutch East Indies	33	$76,375	14	$21,438	262	$305,776	.....	.....	$47,501
French East Indies	25	$16,267	.....	.....	53	$51,860	8	$3,534	$1,161
Hongkong	.....	.....	2	$4,000	6	$7,222	.....	.....	$3,876
Japan	14	$29,291	67	$85,703	258	$215,032	429	$219,491	$59,561
Persia	.....	.....	.....	.....	16	$7,730	.....	.....	.....
Russia in Asia	.....	.....	.....	.....	.....	.....	.....	.....	$3,194
Siam	.....	.....	.....	.....	8	$8,006	.....	.....	$1,843
Turkey in Asia	8	$12,519	12	$6,042	212	$137,218	200	$120,000	$6,149
Australia	5	$7,725	40	$57,878	271	$309,806	515	$577,694	$125,633
New Zealand	14	$37,680	20	$37,090	618	$738,247	8	$8,508	$86,178
Other British Oceania	.....	.....	.....	.....	6	$5,380	4	$3,605	$964
French Oceania	.....	.....	.....	.....	1	$2,000	.....	.....	$1,259
Other Oceania	.....	.....	.....	.....	4	$2,180	.....	.....	$77
Philippine Islands	39	$82,812	34	$57,067	180	$168,802	2	$8,700	$25,505
British West Africa	32	$40,398	21	$28,151	52	$50,524	2	$2,500	$22,679
British South Africa	2	$3,585	3	$6,131	437	$482,927	12	$5,804	$89,236
British East Africa	.....	.....	.....	.....	49	$57,232	.....	.....	$5,945
Canary Islands	.....	.....	.....	.....	7	$9,688	.....	.....	$2,432
French Africa	28	$16,979	4	$1,768	50	$77,767	6	$2,810	$5,753
Kamerun, etc	6	$3,022	.....	.....	10	$5,098	20	$8,838	$757
Morocco	.....	.....	.....	.....	10	$10,000	.....	.....	$1,584
Portuguese Africa	6	$3,221	.....	.....	11	$10,413	2	$882	$1,688
Egypt	.....	.....	5	$4,900	108	$112,235	.....	.....	$9,124
Total	1,435	$2,353,802	1,221	$1,807,909	12,502	$13,491,416	1,875	$1,577,695	$6,790,067

To Increase Cars for Food and Fuel

Rigid Priority Rules Foreshadowed if Congestion Is Not Soon Relieved

NEW YORK, July 3—Some slight recognition of the shipping needs of the automotive industry has been granted by the Commission on Car Service of the railroads which has directed that a survey of the automobile car situation be made at intervals by taking the location statements of roads owning such cars and from that determining the total of all owned on each principal road. The traffic committee of the National Automobile Chamber of Commerce believes this will develop facts which may lead to helpful action. In this connection it is stated that the New York Central has ordered 2500 automobile cars and the Southern Pacific 500.

The accumulation above normal of loaded and empty cars awaiting movement has been reduced from 288,000 early in April to 116,000 on June 11. While this reduction is encouraging it should not lead to undue optimism. There can be no marked or permanent improvement for months to come and the transportation situation is likely to be worse before it is better.

Conditions now, in early summer, when there should be a large surplus of cars, are what might normally be expected in the middle of a hard winter. Industrial plants in many parts of the country are on the verge of closing because of a shortage of fuel and the same is true of public utilities. Those in New York are going on a hand-to-mouth basis and traction lines have been able to keep in operation only by pooling their fuel resources.

Up to June 15 only 2,564,983 tons of coal had been dumped at Lake Erie ports of the 29,000,000 tons required during this season. This compares with 7,076,000 tons dumped on the same date in 1919 and 5,879,000 even in the war days of 1918. Authorities estimate that the tonnage dumped on this date should have been not less than 6,500,000 tons. The Interstate Commerce Commission is using all its energies to facilitate the movement of fuel in an effort to store up a surplus for winter, but present needs scarcely are being met in many parts of the country.

Grain Movement Threatened

Western lines at this season of the year usually have about 40,000 cars assembled in their territory in anticipation of grain movement. There is none at the present time and from 20 per cent to 30 per cent of last year's crop remains to be handled. The harvesting of the new wheat crop already has begun. The farmers have borrowed heavily on the 1919 crop and the banks cannot finance that of 1920 without curbing loans in other quarters until the farmers' old notes are paid.

Food and fuel are admittedly the most essential commodities. The I. C. C. and the Car Service Commission will devote their energies to moving them, under rigid priority rules if necessary. The quantity of rolling stock devoted to this purpose will be steadily increased as the season progresses, leaving less and less for the movement of other commodities, either finished products or raw materials.

The railroads contend shippers are partly responsible for the tangle because of inefficient loading and because they do not load and unload cars as promptly as they might. Shippers contend there is inefficient operation by the carriers themselves. The railroads do not deny this charge with great vigor, but attribute it to labor troubles and lack of equipment. Sporadic strike outbreaks at different points are not helping the situation and the roads have on their pay rolls many "green hands" who have taken the places of strikers. When a new wage scale is announced many of the old employees who quit to take jobs in factories and elsewhere may return, but there is no way of determining how many of them.

Car Shortage Delays Relief

There can be no great relief until the carriers get additional equipment. They cannot hope for the delivery before spring of more than a fraction of the equipment already ordered and few large orders have been placed with locomotive and car builders. Building of new equipment depends on the output of steel and that is being cut sharply because of the lack of fuel and of cars in which to move shipments.

Thus the "vicious circle" runs, emphasing again that without transportation industry is paralyzed.

There undoubtedly is some merit in the assertion of the railroads that shippers are not making the most efficient use of the freight cars at their disposal. There is a woeful lack of transportation and under the circumstances the shippers, in their own selfish interests if for no other reason, should revert to their war time efforts to use to the last pound of efficiency every car allotted them.

Automotive Equipment Not in Trade Treaty

WASHINGTON, July 8—Although resumption of trade relations with enemy countries became effective to-day it will have no effect on the automotive industry. A prohibition has been placed against the shipment of automobiles, trucks and aircraft, or their component parts, to Russia, Hungary, Austria, Turkey and Bulgaria. The restrictions against the automotive industry have been established because these manufactured articles are regarded as materials of war.

Salesmen Abroad Supplant Agencies

Strengthening of Export Competition Leads Manufacturers to Revise Policies

NEW YORK, July 3—Export activities for promoting the foreign sales of automotive equipment and accessories will be taken up by the Motor and Accessory Manufacturers Association following the return from Europe late in July of President C. E. Thompson and M. L. Heminway, general manager. They sailed for Europe several weeks ago to take part in the formation at Paris on June 21 of the International Chamber of Commerce, as representatives of the association, following which they plan an investigating trip through France, England, Belgium, Holland and possibly other European countries.

The need for further promotion work in the export field has been felt in the accessory trade for some time and the European trip of the two association officers was taken with that in view. At Heminway's office to-day it was said that upon their report of European markets and the foreign opportunities for such sales would depend the work to be taken up by the association. The necessity for it was apparent, it was said, the belief being general that this field might be greatly enlarged.

A sales tendency, noticeable within the past few weeks, has been that automotive exporters are making efforts to reorganize their selling forces and "to put their houses" in order to face expected conditions when competition in this field becomes normal again. This has been done, despite the fact that there has been no slackening of foreign demand, exports keeping up to as high a volume as the tangled railroad and production situations have permitted. However, the exporters seem to have realized that this unlimited demand might have a limit and have acted accordingly.

One manifestation of this has been that several concerns, notably in the truck field, have given up export agency connections in New York and have undertaken direct sales of their goods to the countries comprising their markets. Other companies have shown a similar feeling in different ways, the admitted reason being that they were hoping the new arrangements would permit them to hold the markets that have been theirs for the last few months and years.

GETS TRUCKS BY BARGE

ST. LOUIS, July 6—The White company branch here received a consignment of 69 White trucks via the barge Mariner and the steel tug, John L. Lowery. The trucks moved under their own power from Cleveland to Pittsburgh, and thence to St. Louis by water. The trip from Pittsburgh began on June 14, ending here July 1. Fifteen of the trucks were driven across the state to Kansas City.

Fuel Discrimination Alleged on Coast

Dealers Association Cites Instances of Unfairness—No Real Shortage Discovered

PORTLAND, ORE., July 6—Charges that the oil companies operating in this territory are responsible for the gasoline shortage of the past several weeks, with specific instances of alleged discrimination in distribution of gasoline, are contained in a report just made to the Dealers Motor Car Association of Oregon by a special committee named to investigate and take steps to relieve the shortage.

The committee, composed of C. L. Boss, chairman, A. B. Manley, H. H. Eling, J. H. Graham and W. H. Wallingford, with M. O. Wilkins, president of the association, as an ex-officio member, has through its own efforts imported to date 160,000 gal. of gasoline by rail from independent sources in Southern California to relieve the Oregon shortage. Most of this gasoline has been shipped to smaller towns through the state which for weeks were reduced to the scantiest rations for motor fuel.

In its report the committee says:

"Your committee's opinion is that there is no gasoline shortage. There has been no gasoline shortage. And if the public will keep in mind the statements issued by the oil companies since April 1, the committee will be able to prove that there has been no gasoline shortage in the United States.

"The committee will also hazard the opinion that the public is being prepared to pay a higher price for gasoline.

"The first carload of gasoline obtained from independent sources by Portland dealers to help relieve the shortage in Oregon was wired for and purchased without definite knowledge as to the exact cost. It was handled at the branch house of W. H. Wallingford at Corvallis. The cost of this gasoline for delivery at Corvallis was 38 cents per gallon. When it arrived there one of the gasoline companies cut its own regular price 2 cents per gallon and sold gasoline at 24 cents per gallon, making a difference of 14 cents per gallon between this carload and gasoline purchased from regular sources previously suffering from a shortage.

Buy Independent Gas

"Despite this fact, farmers and customers in general took every gallon of the carload at 14 cents more per gallon."

The report further states "that members of the committee visited Dallas and Hood River, where they learned that officials, dealers and the public had been told that the gasoline shortage would continue. At Dallas, dealers combined and ordered a carload through the Dealers Motor Car Association. At Hood River dealers took about the same action with the result that they were notified by the gasoline companies that a carload would be on hand the following day. Two carloads were sent and the dealers told there would not be any further shortage.

"At Corvallis one of the gasoline companies informed Mr. Whiteside, a dealer, that the shortage would last until November. As soon as gasoline was imported by the dealers, however, this company began to supply gasoline freely.

"A week ago one of the oil companies filled the tank of the Manley Auto Co. and notified Manley it would keep his tank full for Shrine week. Another member of the committee, C. L. Boss, of the C. L. Boss Automobile Co., was rationed by another gasoline company during the entire week. This fact was not mentioned until the end of the week to see how fairly and impartially gasoline was being distributed even to the committee itself."

International Steel to Build First Units

ATLANTA, July 6—The International Steel and Motors Corp., recently organized and incorporated with $20,000,000 capital, will build the first units of its immense plant near Pigeon Mountain, where the corporation holds red ore lands now in operation. It was first announced the big plant would be built at Rome, Ga., but the company later changed this policy.

Officers are: Henry Brittain, of New York, president; H. Abner Dean, of Rome, Ga., vice-president; F. W. Teague, of Columbus, Ga., vice-president; James N. Craig, of Birmingham, secretary; John M. Graham, of Rome, Ga., treasurer. Brittain is also executive head of the Terry Shipbuilding Co., Savannah, Ga.; Mobile Shipbuilding Co., Mobile; and the Birmingham Steel Corp., Birmingham.

Manufacturers of the South who will use the products of the new plant in their factories for the most part represent the investors.

The company has taken over the Rome & Northern Railway, extensive ore lands north of Rome, Ga. and other mineral lands in northwestern Georgia.

Standard machinery and standard automobile parts are to be manufactured by the company.

COMBINE MACHINE OFFICES

BOSTON, July 6—A combination has been effected of the sales, purchasing, accounting and executive departments of the Reed-Prentice Co. of Worcester, the Becker Milling Machine Co., Hyde Park, Mass., and the Whitcomb-Blaisdell Machine Tool Co. of Worcester, all of which are owned by the same interests. The main offices now are located permanently at 53 Franklin street, Boston. The various agencies which formerly handled the products of the three factories will be displaced by factory branches. The branches will be located in Boston, Worcester, New York, Detroit, Chicago, Cleveland and Indianapolis. A. H. Weed is president of the combination and J. P. Ilsley is general sales manager.

Highway Council Names Committees

Special Executives Will Strive to Bring Roads to Modern Standards

WASHINGTON, July 3—Special committees are being appointed by the Federal Highway Council to direct the more important branches of the organization's work, which are designed to bring highway development into its logical position as the second most important factor in transportation.

W. J. L. Banham, general traffic manager of the Otis Elevator Co., New York City, heads a committee which will make a close study of short haul and terminal problems. This study will include transportation problems in new territory, transportation surveys, the motor truck in terminal work, store door delivery, motor truck statistics—including costs, rates, etc., and the use of trailers in reducing cost per ton mile.

J. H. Collins, manager of the research bureau of the Chilton Co. of Philadelphia, and formerly of the Bureau of Markets, United States Department of Agriculture, is chairman of the committee on rural motor express. The scope of the work of this committee embraces a study of franchises, insurance, uniform receipts and bills of lading, marketing, return loads, and the present status and development of machinery for putting the rural motor express into actual operation.

The study of highway transport functions of State Highway Departments, including snow removal, traffic surveys and traffic control by State Highway Departments, to the end that constructive suggestions for assistance may be offered where desirable, will be in charge of David Beecroft, directing editor of the Class Journal Co., New York City.

The development of a policy of cooperation with motor truck users, organizations will be in charge of W. H. Stone, associate editor of the *Manufacturers' Record*, Baltimore.

Co-operation in educational work with universities and schools will be directed by Professor A. H. Blanchard, professor of highway engineering, University of Michigan, and president of the National Highway Traffic Association.

JACQUET TO MOVE PLANT

MANITOWOC, WIS., July 7—The Jacquet Motor Car Co. of Belding, Mich., manufacturing Jacquet worm-drive commercial vehicles, has concluded negotiations with the Association of Commerce here, to relocate its works and offices. The removal is made largely because of the convenience of being close to the raw and semi-finished materials market at Milwaukee. Equipment is being shipped from Belding and production will be resumed in the new factory by Aug. 1. Alfred J. Jackson is president and chief engineer.

Buda Urges Loans For Truck Buying

Addresses Letter to Banks Telling of Value in Transportation Crisis

CHICAGO, July 3—In an attempt to ease the credit situation for those interested in the motor truck industry, the Buda Co. has sent the following letter to the largest banks in this territory:

"Based on our observations, there seems to be a growing tendency among the banks, especially the country banks, to curtail the credit of motor truck purchasers. This is in turn having its effect on the truck manufacturers, and through them on the parts manufacturers, of which this company is one. We believe this attitude is based largely if not entirely on a misconception of the importance of the truck to the economic life of the nation at the present time.

"The railroads, which are operating under a very great strain, need and will welcome immediate relief. It probably will be years before they are again in normal condition for handling traffic. Production is the crying need of the day. It alone will bring down the high cost of living. But production without transportation is of no real benefit to anyone. Anything that can be done, therefore, to relieve the present strain on the railroads and to get the foodstuffs to the railroads is essential to the country's welfare. Nothing can do this to the same extent as the motor truck, in so far as short hauls are concerned. This has been amply demonstrated during the past few months, especially at the height of the switchmen's strike, although, of course, the supply of trucks was entirely inadequate to meet demand.

Not Railroad Competitor

"No one will ever intimate that the motor truck can successfully handle the heavy tonnage, long haul business. That is the function of the railroad and that is where the railroad makes its money. Motor trucks are a valuable aid to the railroads, however, on the short hauls and on terminal transfers as well as in bringing the foodstuffs from the farm to shipping point. It is common knowledge that terminal facilities of the railroads are inadequate and anything that will lessen the traffic through congested terminals should and will be welcomed not only by the shipping and consuming public but by the railroads themselves.

"A three-ton truck will haul practically as many tons and produce practically as many actual ton miles per day as the average forty-ton box car in L. C. L. merchandise service. The average merchandise car (not in pedler service) hauls probably not to exceed an average of seven tons, and travels an average of probably twenty-five miles per day, giving it an actual ton mileage of 175 per day. The so-called pedler car will not haul an average of more than four tons and produce an actual ton mileage of one hundred. A three-ton truck will travel on an average, the country over, probably forty-five miles per day and thus produce a ton mileage of say 135 per day, as compared with 100 ton miles for the pedler car and 175 for the merchandise car.

"Every merchandise car, pedler car or terminal transfer car that is released from this unprofitable short haul service can be put into profitable long haul service by the railroads, thus doing a great deal to relieve the traffic congestion. The possibilities here readily can be seen when it is understood that approximately 25 per cent of railroad freight cars are in merchandise service. The railroads to-day are suffering not only from car shortage but from lack of freight house labor. The situation in the latter respect is worse than it ever has been before. Motor truck delivery means store delivery, thus eliminating the freight house labor problem as well as the drayage problems."

Credit of Note Maker Determining Factor

ST. LOUIS, July 6—No discrimination against automobile paper is being made by the Federal Reserve Bank of this district, according to William McM. Martin, Federal Reserve Agent and Chairman of the Board. Regarding the position of the St. Louis bank in this matter, Martin said to-day:

"In pursuance of the policy of all members of the Federal Reserve system, the St. Louis Federal Reserve Bank is endeavoring to encourage the liquidation of commodities and bring about general deflation to the end that the essential credit demands of the country may be satisfied. The crop movement is about to begin and other seasonal requirements will tax heavily the reserves of the banks. For this reason the utmost caution in the matter of granting accommodations is recommended.

"This bank is not discriminating against automobile paper as such, and bills presented for rediscount are being accepted provided the accompanying financial statement shows the security to be absolutely and unquestionably adequate and good. The determining factor, as with all offerings, is the credit statement of the maker of the note. It must show undoubtedly adequate proportion of quick assets to current liabilities and a proper ratio between net worth and debts."

NO STATEMENT IN BOSTON

BOSTON, MASS., July 6—Statements regarding the attitude of the Federal Reserve banks of this district relative to acceptance or refusal of automotive paper as loan securities were refused to-day by the Federal Reserve Bank Governor.

KING PRICES ADVANCE

DETROIT, July 7—Prices on all models produced by the King Motor Car Co. were advanced $150, effective July 1.

Distributer Helps Get Dealer Credit

A. L. Zeckendorf, Detroit, Arranges Plan Which Helps Keep Cars in Motion

DETROIT, July 6—The problem of financing for automobile dealers which has become so acute in the smaller communities is being attacked by A. L. Zeckendorf, Cleveland, Chandler and Cole distributer in Detroit, in a way that is likely to be followed by distributers throughout the country in overcoming the temporary depression in the automobile market. Dealers in the larger cities are finding little trouble in securing financial assistance from the banks, but it is in the smaller cities and towns that bankers have put their foot down.

Zeckendorf, who is one of the largest distributers in Detroit, has sent a special representative to all smaller cities and towns in Michigan to discuss the financing problem with the dealers. This representative enters the dealer's salesroom with full knowledge of the plaint that will be registered by the dealer, namely, his inability to secure help from his local banks.

The plan is for the dealer to give the bank a note for 90 days, the bank in turn giving the dealer a certificate of deposit for the amount of the note less interest, the certificate drawing 4 per cent interest and which cannot be checked against. This certificate in turn is sent to the dealer's distributer in payment for cars, the distributer in turn rediscounting the paper at his own bank. The dealer gets his automobiles turns them over, gets his money from his customers and if he sees fit may turn that money over several times before the 90 days has expired, when he must take up his note.

Deny Responsibility for Bank Refusals

(*Continued from page* 88)

a large number of small banks in the country avoid making loans on automobiles and tractors because they do not know how to handle such paper. It is said that the Dallas County State Bank handles more automotive paper in proportion to its capital than any other bank in Texas.

"For years, country bankers have been lending money on livestock and on crops," said Mr. Thornton, "but lending money on automobiles is comparatively new to them. They are not familiar with the procedure and they will generally show preference to livestock and crop loans. Also, a number of the small bankers are not familiar with the Federal Reserve System and do not avail themselves of its privileges. As a matter of fact, bankers who have handled all kinds of paper will say that automobile loans are among the most desirable."

Vulcan Cuts Price of British Truck

American Production Methods Increases Output—Wallace Introduces New Light Truck

LONDON, June 18 (*Special Correspondence*)—The Vulcan Motor Co. of Southport, Lancashire, recently marked the passing out of the 1000 truck chassis for this season by a public celebration. The company has followed that event by reducing the price of the chassis 10 per cent. This reduction is noteworthy because of the tendency of chassis prices to rise and the hold up of materials for certain components.

The Vulcan company's output is almost limited to a 3000 lb. truck. The company is in the Harper Bean group, which has a holding in the Hadfield steel works at Sheffield. Their present output is averaging 100 chassis a week. Recently the works were "Americanized" for production methods, and the chassis are assembled on rail trolleys. The Vulcan truck, however, is threatened with a formidable competitor in the new "Wallace" which is listed at the same figure and weighs about 400 lb. more, due to the larger girth of certain sections and the stouter and larger springs used.

The Wallace takes its name from Sam Wallace, who is managing director of the company and has associated with him Frank Rowan, formerly British manager to Gaston Williams & Wigmore, Ltd. (now styled Gaston, Ltd.), and the managing director is Major Allday, a near relative of the brothers Allday, pioneers in the British car and truck trade.

The Wallace is a remarkable little truck with a Continental engine and Clark internal hub-geared axle. It was successfully demonstrated this week at a press function, at which it ascended a long test hill averaging 1 in 8 grade, with a finish of 1 in 4 at the top. Wallace proposes to sell this truck through dealers in his former A. E. C. 7000 lb. truck, the chassis of which is the same as used for the London General Omnibus Company's B type buses.

Wallace holds that there is a scope for 40,000 3000 lb. trucks in Britain, and certainly he seems to have lost no time in giving effect to his intention to make good for the market. His former British friends were glad to see him and his co-director Frank Rowan looking fit and optimistic about their prospects.

REDUCE LONDON-PARIS RATES

LONDON June 18 (*Special Correspondence*)—According to the American Chamber of Commerce in London, a new era in civil flying will be opened up by the announcement of the reduction in the passenger rates on the London-Paris Air Route. Rates have been reduced from £15 15s. to £10 10s. for single fares, and return fares from £26 5s. to £19 8s., which includes conveyance of passengers in motor cars from the West End of London to Croydon Aerodrome, and from Le Bourget Aerodrome to the center of Paris.

The introduction of a new type of single engine express, carrying 8 passengers instead of 4, has made this possible, says the American Chamber, and it is expected that the time taken in the flight will also be materially reduced at an early date.

Special Cables

PARIS, July 6 (*By cable to* AUTOMOTIVE INDUSTRIES)—Modification of the decree prohibiting importation of touring cars is expected next week. It probably will take the form of permits for the importation of a limited number of foreign automobiles. The Government is issuing special permits for the importation of American passenger cars which will be used by tourists.

The French motor truck market has suddenly become dull because of the heavy sale of army stocks. All manufacturers now are in a position to deliver from their stocks. Berliet is reported to have 1000 trucks awaiting buyers and has cut production.

Renault has large stocks on hand and has laid off nearly 1000 workmen. The Renault 10 hp. car is in production.

The French Grand Prix road race, officially announced for the summer of 1921, probably will be held near Strasbourg. The maximum piston displacement will be three litres, or 183 cubic inches. Prior to the race there will be a bench test of engines at which not less than 90 hp. must be developed at 3000 r.p.m. and not less than 30 hp. at 1000.

A meeting has been called for early next week at which it will be decided whether or not to hold the French automobile salon, which has been held in abeyance. Meanwhile London and Brussels are going ahead with arrangements for their shows.

Two new daily air services have been organized. They operate between Paris, Geneva and Brussels. The present Paris-London air service is unable to handle all the applicants for passage.

COMPANIES BUY COAL LANDS

NEW YORK, July 6—The General Motors Corp. is one of the big companies included among the purchasers of coal lands valued at $12,000,000 located in West Virginia, Kentucky, Ohio and Pennsylvania. The property includes that of the Bertha Coal Co. Value of the output will be increased from $8,000,000 to $12,000,000.

The purchasers, besides General Motors, include the Harbison-Walker Refractories Co., Armstrong Cork Co., Quaker Oats Co., Clark Paper Co., Standard Parts Co., Cumberland Glass Mfg. Co. and Sebring Pottery Co. Several independent steel companies and several New England textile companies also were interested in the transaction.

British Get Great German Dirigible

L-71 Turned Over Under Armistice May Be Used on Imperial Route

NEW YORK, July 2—News dispatches from London relate that the L-71, largest of the German war dirigibles now in existence, has just been surrendered under the armistice terms to the British, the big airship now being moored at the Pulham airdrome. The surrender almost coincided with the anniversary of the sailing from East Fortune, Scotland, of the British dirigible R-34 on its famous trans-Atlantic flight one year ago to-day.

The L-71, however, is a much larger ship than the better known R-34. It has a length of 743 ft., compared with 680 ft. for the British machine, and the comparison of gas capacity is 2,420,000 cu. ft. against an approximate 2,000,000. The L-71 was completed in 1918, in which year two other types—the L-65 and the L-70—also came out of the German workshops. Of these, the L-71 had the greatest gas bag capacity, but it was exceeded in speed by the L-70, which was destroyed by the British before the end of the fighting. The L-65, which preceded the other two, was the first of the German ships to have propellers driven directly and likewise was featured by a new and improved type of car, much lighter than those of the earlier models.

The surrendered airship has a total lift of approximately 73 tons, a speed of 72 m.p.h. and a ceiling of 23,000 ft. These figures show that during the four years of hostilities the Germans practically tripled the lift and the gas bag capacity of their airships by lengthening them from 453 ft., the length of the largest ship in 1914, to the 743 of the L-71. Speed, in the same time, increased from 43.5 m.p.h. to something like 75 in the ship destroyed in 1918.

To Make Colonial Flights

Disposition of the German airship is considered problematical, as the British authorities have given no hint as to the use to which it will be put. Recent agitation in England, however, has been to the effect that it, as well as other airships, should be put into service on the so-called Imperial Route which would link up the British Isles with some of the distant British possessions. This plan, which the Government has been urged to adopt and which already has been exploited by airplane flights, would have as its first leg London to Cairo. Two lines would radiate from the latter place, the first south over Africa to Cape Town and British South Africa and the second eastward to India and perhaps to Australia. The Cairo flight could be accomplished, according to the calculations, in some two days, with either Cape Town or India some two or three days further removed.

INDUSTRIAL NOTES

Irvin Robbins Co., Indianapolis, manufacturers of automobile bodies, is completing a large addition to its manufacturing plant, the new building being 400 ft. long with one floor devoted exclusively to bench work. The company is also erecting a modern boiler house and is installing sufficient boiler equipment to provide for further enlargement.

Wisconsin Rim Wheel Mfg. Co., Milwaukee, manufacturer of steering wheels for motor vehicles has moved into its new factory in West Allis where it is increasing its output by 200 per cent. The product is marketed through the Fulton Co., Milwaukee.

Jorgenson Mfg. Co., Waupaca, Wis., manufacturer of priming devices and other gas engine parts and specialties, is working on the first in a series of plant additions to be made following a recent increase in capitalization from $75,000 to $350,000.

Surety Tire & Rubber Co., St. Louis, is planning to erect a new plant with an annual production capacity of $20,000,000 to supplant another factory, but steps will not be taken until conditions for building become more favorable.

Globe Electric Co., Milwaukee, manufacturer of farm lighting systems, motors, generators, etc., has let contracts for erection of new works. The first unit, which will cost $200,000, will be ready to start production Sept. 15 or Oct. 1.

American Automobile Parts Co., Detroit, which is erecting a factory 5½ miles out on Gratiot Avenue, will be in production in August with leaf springs. It will have a capacity of 3000 tons a month when in operation.

Automotive Trailer Corp., Springfield, Ill., is having constructed a unit plant near No. 3 mine, in which will be manufactured trucks ranging in capacity from three-quarters of a ton to ten tons.

American Chain Co., Bridgeport, Conn., has added four large plants to its seven units, but is not prepared to make a definite statement as to the uses the new additions will be put.

Jefferson Electric Manufacturing Co., Chicago, manufacturers of coils, are extending their production facilities and have taken over space which will permit of doubled output.

American Steel Foundries Co., Chicago, which has been making a disk steel wheel for cars and light trucks, contemplates production of a cast steel wheel for heavier trucks.

Oshkosh Motor Co. contemplates the erection of another addition to its plant which will provide nearly 50 per cent more space.

Buck-Eye Steel Foundries Co., Columbus, manufacturer of railroad castings, plans making a cast steel wheel for trucks.

White Company, Cleveland, has moved its advertising offices from 1836 Euclid Avenue to 6611 Euclid Avenue.

Studebaker Corp. has awarded a contract for the erection of a new 5-story plant in Detroit.

SOUTHERN STARTS PRODUCTION

MEMPHIS, TENN., July 2—The Southern Automobile Mfg. Co., capitalized at $1,000,000, is getting into the manufacturing field at Memphis, having recently gotten under way a factory structure in the manufacturing district of the city. W. A. King is president and general manager; Lovick P. Miles, vice-president and general counsel; William A. Shibley is secretary and treasurer; W. B. Frazee is sales manager. The purpose of the company is the manufacturing and assembling and sales of automobiles, trucks and tractors as well as tire equipment. A six-cylinder car will be manufactured. It is contemplated to manufacture 2000 cars the first year.

Tire Makers to Build Own Homes in Akron

AKRON, July 3—Employees of the General Tire & Rubber Co. have undertaken a building project on a 243-acre tract in East Akron on which they will erect 1,000 homes. The development will be known as General Hills. The plan was evolved by W. O'Neil, general manager of the company and the workers themselves have undertaken its financing. The management of the enterprise will be under the direction of O'Neil.

Homes will cost from $5,000 to $6,700 and work already has been begun on ten of them. Streets are being graded and improvements planned.

A full growth of timber, together with sand and gravel, on the tract will assure a great saving in the cost of building.

A canvass of General Tire Co. employees showed many workers acquainted with other lines of work. One employee had 20 years' experience in sawmill and lumber work. He has been placed in charge of the timber tract and will cut and prepare the lumber.

Carpenters, plumbers, electricians, all in the employ of the rubber company, will build the homes in General Hills.

Plans for the community call for its own water supply. A business center has been established. Transportation of workers a little more than a mile from the factory will be by bus.

The offer to the men was made to enable them to invest wisely and to substitute for unwise investments in wildcat stock companies, O'Neil said.

SEVERIN SETS 3000 GOAL

KANSAS CITY, July 6—Manufacture of 3000 cars in the next twelve months is the aim of the Severin Motor Co., equipment of whose plant was begun last January. The company starts this week on a schedule of one car a week which is expected to increase until the maximum of production is attained. According to H. T. Severin, president, all of the 3000 cars planned have been sold by mail. The Severin is an assembled car. At a recent meeting of the directors it was voted to increase the stock of the company from $300,000 to $500,000. Officers of the company are, besides Severin, J. F. Platt, vice-president, and Roy L. Mattox, secretary-treasurer. The directors are Severin, Mattox, S. F. Warnock, R. L. Wall, Mark Laffoon, F. L. Meader and A. M. Soudry. W. H. Hummell is factory manager and C. M. Miller factory superintendent.

METAL MARKETS

Warnings from Detroit automotive interests to the steel industry that further advances in the price levels for raw materials would be nothing short of a menace to the continuity of business and that in many commodities price reductions should not be delayed too long, made a deep impression on the thoughtful part of the steel market and, while price concessions are by no means spectacular so far, the tendency all along the line is downward. Even in the pig iron market which continues under the spell of abnormally high coke prices and utterly demoralized transportation conditions, leading interests are striving to keep prices from running away. The smaller independent steel makers are beginning to realize that their prosperity in 1921 is wrapped up to a large extent in the well being of the automotive industries and that it would be folly to kill the goose that lays the golden egg. There will be demand for railroad equipment, for industrial needs and for structural purposes, but the automotive industries furnish the only outlet that assures a fair margin of profit to high cost producers. The latter see now that to drive these prices higher would jeopardize this class of trade and therefore be nothing short of suicidal.

Steel—Although the volume of new inquiry from automotive sources for hot and cold rolled strip steel is reported comparatively light, Pittsburgh advices say that one of the largest automobile builders is inquiring for a larger tonnage of strip for 1921 delivery than called for by his 1920 contracts. The General Motors Corp. is reported to have bought recently 10,000 tons of open-hearth sheet bars at $70 for conversion by the American Sheet & Tin Plate Co. The same interest took a round tonnage of billets at $65. These price levels represent a reduction of at least $5 from the premium market of a month ago. In other words, the automotive industry has quit buying steel at any price. The Vreeland Motor Co., of Irvington, N. J., is reported to have postponed construction of its plant because it could not obtain 300 tons of structural steel at the right figure.

Pig Iron—With all gondola cars diverted to the coal traffic by order of the Interstate Commerce Commission, furnaces are in many cases condemned to idleness. Coke prices continue abnormally high. For all that, there is a disposition to adhere to the $45 quotation as the base price for foundry. Northern and southern pig continues to be offered for resale by the Ford interests at $44, base, for 1.75 to 2.25 silicon.

Aluminum—Sheet aluminum continues in inadequate supply and in the Middle West up to 60c. has been paid. Some Norwegian virgin ingots are offered at below the American producer's quotation of 33c., but demand just now is rather for rolled products than for ingots.

Lead—Resellers continue to ask ½c. more for spot and nearby metal than the chief producer's official quotation of 8c., New York. The latter appears to confine sales, however, to regular customers.

Zinc—Mines and mills are shutting down in an attempt to improve the market, which is dormant at 7⅝c., East St. Louis.

Brass—The labor situation in the Waterbury district is somewhat improved.

Tin—Speculation appears to be dying out and the market is quieting down.

Automotive Financial Notes

Production Machine Tool Corp., Milwaukee, has been organized by Charles Gordon, head of Charles Gordon, Inc., Milwaukee, a large jobber in machine tools. The corporation has an authorized capitalization of $250,000 and will engage in the manufacture of metal-working machinery of various kinds. Definite plans will be announced later. George E. Ballhorn, Milwaukee, is one of the incorporators and counsel for the company.

The Aluminum Goods Mfg. Co., with main works and offices at Manitowoc, Wis., has increased its authorized capitalization from $8,000,000 to $12,000,000. It operates five large plants, including two at Two Rivers, Wis., and one each in Newark, N. J., and St. Louis, besides the Manitowoc plant. About $2,500,000 is being invested in new buildings and equipment in 1920. George Vits is president and general manager.

United States Tractor & Machinery Co., Menasha, Wis., has increased its capitalization from $250,000 to $500,000 to accommodate the growth of the business and to finance enlargement of the plant now under way. The output of tractors will be increased from 50 to 100 per cent within the next six months. Joseph G. Sailer is president and G. H. Harris, secretary.

Dixie Carbureter Lock Co., capitalized at $100,000 under the laws of the State of Missouri, has opened offices at 209 Keith and Perry Building, Kansas City, and announces $50,000 of the capital paid in. The product is termed a theft proof, gasoline saving carbureter lock and is manufactured in Chicago. The capacity of the plant, which started operations March 1, is about 100 locks a day.

Continental Axle Co., Edgerton, Wis., established a year ago to manufacture motor car, truck and trailer axles, is increasing its capital stock from $200,000 to $500,000. The original plant is now being doubled in size. The concern is owned largely by stockholders in the Highway Trailer Co., of Edgerton. Andrew McIntosh is president and E. Z. Menhall, secretary.

American Valve Rotator Co., Milwaukee, has filed papers of incorporation with a capitalization of $100,000. The company will manufacture and market a novel device for rotating poppet gas engine valves. The incorporators are Henry Danischefsky, vice-president of Pabst Brewing Co.; J. A. Diethrich and Howard Foulkes, attorneys at Milwaukee.

Fisher Body Corp. has declared a dividend of 1¾ per cent on the preferred stock of the company payable to holders of preferred stock of record June 20. A dividend of $2.50 a share was also declared on the no par common stock of the company to stockholders of record of June 20.

Rauch & Lang, Inc.—Stock of the company is offered by H. W. Dubiske & Co., Chicago, in blocks of one share each of common and preferred. Preferred to the amount of $1,000,000 is being offered. Proceeds will be used as additional working capital and to build a new plant.

American Bosch Magneto Corp. will pay a 20 per cent stock dividend to stockholders, according to announcement made at a meeting in New York. Earnings are reported to be running at the rate of $24 a share before deducting taxes.

New Castle Rubber Co., New Castle, Pa., has called a meeting of stockholders to decide on an increase of capitalization to $3,000,000. Plans are also being made to double the capacity of the plant and greatly extend the facilities.

Farmers' Tractor Corp., Walkersville, Md., has been incorporated with a capital stock of $100,000 by Edwin T. Dickerson, Edward J. Routzahn and George F. Brandenburg, to manufacture motor tractors for farm service.

Erie Tire & Rubber Co., Sandusky, O., has declared a dividend of 7 per cent to stockholders of record July 1, 1920. Additions and enlargements to the factory facilities at Sandusky are under way.

De Long Motor Car Co.—Works of the company at Pittsburgh have been purchased by A. M. Bakewell for $55,000. It is understood the plant will be operated by the Bakewell Motor Car Co.

Limousine Top Co., Kalamazoo, Mich.—Name changed to Limousine Body Co. and capital increased from $200,000 to $500,000. The company is erecting a big dry kiln.

Rex Motor Car Mfg. Co.—Capital increased from $250,000 to $1,000,000 and part of proceeds will be used to erect a new plant in New Orleans.

Studebaker Taken Off Detroit Stock Market

DETROIT, July 2—Studebaker corporation stock was removed from the Detroit Exchange, effective July 6, by the Board of Governors, on request of the Studebaker corporation, directors of which declined to file papers with the State Securities Commission seeking approval of the capital increase in the company's outstanding stock announced last winter. The board's announcement says action was taken without prejudice to Studebaker or its securities and intended solely to conform with regulations and jurisdictions of the commission prohibiting trading in stocks not approved.

RITE-LITE CAPITAL $3,000,000

MONTCLAIR, N. J., July 6—The Victor Rite-Lite Co. is increasing its capital from $125,000 to $3,000,000, chiefly to erect a foundry and enlarge its other departments. It has purchased the business of the Standley Non-Skid Chain Co. and will take over national distribution of all the Standley products. In addition it will put on the market the Victor "Rite-lite" which will enable the lamps of a car to swing with the wheels. The president is Hector S. Hill.

G. M. C. GETS IRON PLANT

MILWAUKEE, July 6—Reports that General Motors has taken over the plant and business of the Waukesha Malleable Iron Co. at Waukesha, Wis., to serve the Samson Tractor Co. plant at Janesville, Wis., with its malleable casting supply, have been confirmed by Conrad A. Haertel, president and general manager of the company for 27 years. W. C. Durant, president of General Motors, came to Waukesha in person to close the deal, which is on the basis of a five-year lease, with option to purchase at the end of three or five years. The consideration is $1,500,000. The Waukesha company is capitalized at $1,000,000 and employs 600 operatives. Important enlargement will be made by the new owners. Waukesha is about 40 miles from Janesville. John E. Haertel is retained as general superintendent and the Waukesha company will retain its identity, although under the direct management of J. A. Craig, president of the Samson Tractor Co., with offices at Janesville.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

NEW YORK, July 7—The Government's monthly report on the condition of the cotton crop as of June 25 shows gratifying improvement in the month. The improvement was general, but most marked in Texas, Arkansas, Alabama and Tennessee. The condition is reported as 70.7 per cent of normal, or a gain of 8.3 points since the May report, and comparing with 70 per cent on the corresponding date last year and a ten-year average of 79.8 per cent. This condition forecasts an estimated yield of 11,450,000 bales, as compared with an ascertained production of 11,329,775 bales last year. The improved agricultural outlook in general is a welcome stimulus to confidence in respect to the volume of the country's business in the latter half of the year.

The past week was without extraordinary developments in the money market. Demand money rates ranged from 7 to 15 per cent, as compared with a range of from 7 to 14 per cent the previous week. The sharp rise to 15 per cent on Wednesday—the first time in two months the rate was so high—was the outgrowth of preparations for July 1 disbursements. There was almost no activity in the local time-money market, with rates remaining as they were last week, from 8 to 9 per cent. Commercial paper rates also were unchanged. The Federal Reserve banks of Philadelphia and Atlanta have established a discount rate of 6 per cent on paper secured by Treasury Certificates of Indebtedness bearing 6 per cent interest.

The gold reserves of the Federal Reserve System showed only a slight change last week, an increase of $2,321,000. Bills discounted secured by Government war paper increased $16,912,000 and total discounts $104,300,000. Net deposits increased $32,677,000 and Federal Reserve notes $52,096,000. Although the New York Federal Reserve Bank reduced its loans to other Reserve banks by $26,606,000, together the Reserve banks of Boston, New York and Cleveland increased their loans to seven other Reserve banks by $5,900,000 to a total of $130,900,000. The net result was a decline in the ratio of gold reserves to Federal Reserve notes, after setting aside 35 per cent against net deposits, from 48.3 per cent a week earlier to 47.2 per cent on July 2.

Men of the Industry

George Wagstaff has joined the sales force of the Central Steel Co., Massillon, Ohio. Wagstaff was sales manager of the Onondaga Steel Co., Syracuse, N. Y., for three years and prior to that was associated with Bethlehem Steel Co. as sales representative in the Cleveland district. He will be district manager of sales in charge of the Chicago district. Clarence Beach, present manager of the Chicago office, will open offices in Indianapolis, covering Indiana, western Ohio and the southern territory adjacent.

Edward J. Fisher of Detroit has joined United States Automobile Gear Shift Co., Eau Claire, Wis., as factory manager. The company manufactures automatic hydraulic gear-shifting devices for motor vehicles. Fisher resigned June 15 as assistant superintendent of the Essex factory at Detroit to accept the position. He formerly was associated in executive capacities with Underwood Typewriter Co., Moore Drop Forging Co., Henderson Motorcycle Co., Wagner Electric Co. and Remington Arms Co.

A. H. Grayburn, for the last four years assistant to the vice-president of the Norma Co. of America, has been made assistant secretary and assistant treasurer of the concern. Norman Bell has been made assistant sales manager of the Norma Co., this appointment following a connection of more than three years with the concern as sales manager.

Edward E. Britigan, for several years connected with American Die & Tool Co., Reading, Pa., manufacturers of automobile transmissions, axles, gears, tools and machinery, in the capacity of engineer, has severed his connection with this concern and after a short vacation will follow machinery or automotive sales or service work.

George O. Starr of Larchmont Motors Corp. has joined the sales force of A. H. Lyons Co., Philadelphia, manufacturer of Lyons Storage Batteries, as district sales manager. R. F. Bray, formerly with Bigelow-Willey Motor Co., Philadelphia, has also joined the sales force of the Lyons company.

John Black, representing the Washington consulting engineering firm of A. & D. R. Black, is on a trip to Paris and London to obtain first-hand information on conditions in the aircraft business and to discuss with French and British manufacturers the question of co-operating with his firm.

Jean Nehmelman has been appointed sales manager of Madison Tire & Rubber Co., Inc., New York. Sylvan E. Weil will continue as assistant sales manager. George Shortmeier has been appointed manager of the New York branch. All have been connected with the company since its inception.

L. N. Burns, who recently became associated with Racine Auto Tire Co., Racine, Wis., has been made head of Horse Shoe Rubber Co. of Missouri. Burns was formerly vice-president and general sales manager of J. I. Case Plow Works Co., Racine.

A. H. Mitchel and E. R. Abbott, formerly with H. W. Cotten, Inc., have become associated with Coe - Stapley Manufacturing Corp., with headquarters at 136 Liberty Street, New York. They will have charge of contract sales work.

Fred A. Bigelow has been elected president of Carpenter Steel Co., Reading, Pa., succeeding W. B. Kunhardt, who becomes chairman of the board of directors.

William Elliott Phelps has become associated with Haynes Automobile Co. as district sales manager. He was formerly connected with the Winton Co. and at one time was general sales manager of the All-American Truck Co.

Verne E. Burnett, former editor of the National Gleaner Forum, has joined the advertising department of Liberty Motor Car Co., Detroit.

W. R. Green and F. A. Shepherd have been elected directors of the Marsh Motor Car Co.

Cadillac Old-Timers Get Service Medals

DETROIT, July 2—Cadillac service records made public with the distribution of medals recently brings to light interesting facts regarding the employees of the company, many of whom have seen 20 years of service. The report shows service records as follows:

Vice-president, 15 years; general sales manager, 15 years; assistant treasurer, 15 years; industrial manager, 15 years; accounting department head, 16 years; construction superintendent, 16 years; production statistician, 20 years; technical manager, 14 years; electrician, 17 years; three superintendents, 15 years; chief engineer, 9 years; electrical engineer, 14 years; experimental engineer, 12 years; manager of purchases, 12 years; eight superintendents, 10 years; nine general foremen, 10 years; 65 foremen, 10 years.

The report shows 390 men who have been with the company from 10 to 20 years and 1011 men who have served more than five years.

HARVESTER OFFICIAL DIES

CHICAGO, July 3—Philip Sidney Post, vice-president of the International Harvester Co., died June 27 at his home at Winnetka, Ill., after a brief illness. He was appointed general counsel of the company in 1910 after having served two years as an assistant. In recognition of his services he was elected a vice-president in May of last year, with special executive duties, including the company's public relations. Prior to that time he had been closely identified with the development of the corporation's welfare activities and was the author of its industrial relations plan.

Judge Post was born in Vienna in 1869 while his father, General Philip Sidney Post, was American consul general there.

CANANDAIGUA HONORS WILLYS

CANANDAIGUA, July 6.—Willys Day will be celebrated in Canandaigua Friday. John North Willys, the automobile magnate, will be the guest of honor of his old home town. Dr. George D. Wood, who used to go swimming and fishing with Mr. Willys back in the halcyon days, will be the chairman of the committee on arrangements.

The business section of the town will be elaborately decorated, there will be a public reception to Mr. Willys on the courthouse square and a big dinner in the community building.

The invitation extended to Mr. Willys, which he has accepted read in part: "Recognizing your achievements and awake to the fact that we are of your old home town, and zealous that yourself, ourselves and the country be impressed with the fact, we address ourselves to you with a sincere request that you permit us to bring about a reunion, so to speak, and to that end we hereby respectfully invite you to attend with us, at our city, a reunion banquet, in your honor."

FEDERAL EMPLOYEES PICNIC

MILWAUKEE, July 2—The annual picnic and outing of officials, foremen and department heads of the Federal Rubber Co. was held at Keipper's Park, Brown Deer, on Saturday. The trip from the plant in Cudahy was made by automobile and about 200 persons were in attendance. Athletic contests and baseball games between the office forces and the factory featured. After the dinner on the grounds Phil Grau, manager of the Milwaukee Association of Commerce, addressed the picnickers and was followed by department officials of the Federal concern. The outing was given under the direction of A. A. Frank, factory manager; R. M. Lauer, assistant comptroller; E. H. Fitzgerald, safety director; Wiley Miller, athletic director, and W. R. Peer, office manager.

CHEVROLET QUITS TRACK

INDIANAPOLIS, July 6—Louis Chevrolet, internationally known as a racing car driver, has retired from the track to devote all his time to engine design for the manufacturers of Monroe cars. His last race was in the Indianapolis sweepstakes when he drove his Monroe for the greater part of the race but was forced to retire when a steering knuckle broke. Many features of the Monroe cars in this race were developed by Chevrolet.

N. A. C. C. TO MOVE JULY 12

NEW YORK, July 3—The National Automobile Chamber of Commerce will be moved on July 12 from its temporary location in the Grand Central Palace to its permanent headquarters in the new Marlin-Rockwell building at Madison Avenue and Forty-sixth Street.

INVITE TRACTOR EXHIBITS

BATAVIA, N. Y., July 3.—The Agricultural Society has issued invitations to 220 tractor manufacturers to exhibit at the annual county fair this year. A new automobile exhibition building is to be erected at Exposition Park which will house all still exhibits at future fairs. The building will be 250 x 60 feet and of concrete construction.

Calendar

SHOWS

Aug. 23-27—San Francisco, National Traffic Officers' Safety First Exposition, Auditorium, C. De Witt De Mar, Manager.

Sept. 20-26—Los Angeles, National Tractor and Implement Show of the West, Tractor and Implement Dealers' Ass'n of Southern California. Guy H. Hall, Mgr.

Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.

Nov. 15-20—Chicago, Automotive Equipment Show, Coliseum, Automotive Equipment Association.

Dec. 10-18—New York. Motor Boat Show. Grand Central Palace.

Jan. 8-15—New York. National Passenger Car Show, Grand Central Palace. Auspices of N.A.C.C.

Jan. 29-Feb. 4 — Chicago, National Passenger Car Show, Coliseum, Auspices of N.A.C.C.

FOREIGN SHOWS

July 9-20—London, England. International Aircraft Exhibition. Olympia. The Society of British Aircraft Constructors.

Aug. 7-Sept. 15 — Motorcycles, sidecars, etc. Antwerp.

October—London. Commercial Vehicle Show, Olympia.

November—London. Passenger Car Show, Olympia.

CONTESTS

July 17 — Warren, Pa. Dirt track.

July 24—Watertown, N. Y. Dirt track.

July 31—Fulton, N. Y. Dirt track.

Aug. 7—Erie, Pa. Dirt track.

Aug. 14—Buffalo, N. Y. Dirt track.

Aug. 20-21—Middletown, N. Y. Dirt track.

Aug. 21—Johnstown City, Pa. Dirt track.

Aug. 21—Elgin, Ill. Road race, Chicago Automobile Club.

Aug. 28—Canandaigua, N. Y. Dirt track.

Aug. 27-8—Flemington, N. J. Dirt track.

Sept. 5 — Targa Florio Race, Sicily.

Sept. 6—Hornell, N. Y. Dirt track.

Sept. 6—Cincinnati, O. Speedway.

Sept. 6—Uniontown, Pa. Speedway.

Sept. 17-18—Syracuse, N. Y. Dirt track.

Sept. 25—Allentown, Pa. Dirt track.

Oct. 1-2—Trenton, N. J. Dirt track.

Oct. 8-9—Danbury, Conn. Dirt track.

CONVENTIONS

Aug. 10—Niagara Falls, Ont. Automotive Metal Wheel Ass'n. Clifton House. Standardization Discussions.

Sept. 16-17—Cleveland. Motor and Accessory Manufacturers' Ass'n. Credit Convention.

War Planes to Fly New York to Alaska

MINEOLA, N. Y., July 6—The War Department has announced that four army airplanes will fly from New York to Alaska leaving here July 15. They will take a northern course which has never been flown over before. The flight is for the purpose of blazing a new trail for commercial and post office routes and also to do some mapping of previously unsurveyed regions.

The airplanes will be DH-4Bs under the command of Capt. St. Clair Street. Capt. H. J. Douglas left Washington June 5 to make a preliminary survey of the route and his reports indicate that the project is entirely feasible and the local residents along the line are making great efforts to be of assistance as they realize the value to them of such a pioneer venture. The machines have been specially groomed for the trip and tanks fitted which will give them a four and a half hour flight duration.

The portion of the route in Canada has been surveyed by the Canadian Air Board and this organization is co-operating in every way possible with the U. S. Air Service.

Photographs will be taken of all landing places and points of interest along the route. A photographic map will be made of the area north of parallel 66 degrees which includes the Yukon River where it crosses the parallel between Circle and Fort Hamlin. The base for the photographic work and for repairs will be Fairbanks.

STEPHENS WINS COAST RUN

SACRAMENTO, CAL., July 2—The Stephens won the first annual Sacramento-Tallac Reliability and Economy Run to Lake Tahoe and return, a distance of 261 miles. The Stephens finished with a score of 309.26, as against 307.96 for the National and 303.37 for Essex.

In the five economy classes the Chevrolet won in class 1, the Dort in class 2, the Essex in class 3, the Franklin in class 4 and the National in class 5.

The race is perhaps the most exacting test of any run in the West. Gears and clutch were engaged at all times, the motor must not be stopped and but two minutes variation from the time set for arrival was allowed.

The run to Lake Tahoe was made June 21, with five hours and a half allowed for the 109 miles, and the return next day was with six and a half hours for 152 miles.

Kansas City to Build Through Roads to City

KANSAS CITY, July 3—At a meeting of business men of the two Kansas Cities, presided over by W. S. McLucas, president of the Kansas City Chamber of Commerce, plans were made for raising $100,000 for the promotion of good roads in a 100-mile radius of Kansas City. McLucas will appoint a committee of twenty-five to conduct the money-raising campaign and to nominate officers for the Good Roads Association of Greater Kansas City, which will spend the money. The fund is to be solicited from business interests chiefly, on the ground that it is the business interests which will benefit from improved transportation conditions rather than the owners of motor cars.

DECENNIAL PROGRAM SET

MADISON, WIS., July 3—The program of the decennial celebration of the Forest Products Laboratory has not been arranged in detail as yet but the general features have been decided upon. The morning of July 22 will be devoted to meeting old friends. The gathering will be formally opened with "keynote" addresses of welcome by speakers of national importance. In the afternoon the laboratory will be open to inspection. In the evening there will be a dinner to be followed by addresses.

The morning of the 23d will be devoted to informal gatherings to hear talks by the experts of the laboratory staff. The afternoon will be devoted to a picnic across the lake.

Planes Prove Value on Mexican Frontier

FORT SAM HOUSTON, TEXAS, July 2—Some wonderful flying feats of a practical nature are being done by the men in the air service of the army on the Mexican border without much being said about them. Besides the military airplane patrol of the long and isolated frontier region that is being kept up constantly, many important messages of an official nature are carried from place to place by this new method of transportation. Military activities of all kinds are greatly expedited by the use of airplanes, it is asserted.

Only a few days ago complete details of the construction project of the housing facilities for the air service along the Mexican border were sent for and obtained by Capt. Walter G. Hollingsworth, who is attached to the Mexican border projects office in 100 hours, the trip being made by airplane. Profile maps of all of the flying fields were obtained, positions for water mains and sewers ascertained and all material was checked over the 1400-mile border in exactly 28 hours flying time. It is considered that the trip from place to place, if it had been made, by rail would have consumed at least three weeks in order to secure all of the data brought back.

BRITISH TO HOLD TWO SHOWS

LONDON, June 25—(*Special Correspondence*)—The Society of Motor Manufacturers & Traders will hold two shows simultaneously this winter, the one as heretofore at Olympia and the other at the White City. The latter building with its vast machinery halls and other halls is big enough to house the whole show, which makes it difficult to understand the decision practically to duplicate the cost of the show and to impose delay and waste of time on all concerned, besides making visitors pay twice over for seeing both shows. The S. M. M. & T.'s November, 1919, show—the first post-war trade show—yielded some $195,000 to that body's exchequer.